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ABSTRACT

The partial credit model of G. N. Masters (1982), a one-parameter unidimensional polychotomous Rasch model, was used to reduce the error of measurement, particularly for students near the cut score, and to permit measurement to reflect the actual ability of a student more accurately by reducing the degree of misfit for students near the cut scores. Two implementations of the extended Rasch model, the FACETS and BIGSCALE programs, were used in the application of polychotomous scoring to the Michigan Educational Assessment Program (MEAP) spring 1990 item tryouts of the Essential Skills Mathematics Tests. FACETS produces a Rasch analysis of many-faceted data through iterative maximum likelihood estimation. The dichotomous analysis was made with BIGSCALE, which fits the one-parameter Rasch measurement model to the data. Item responses were examined for approximately 264 10th-grade students. The analysis did not show a major difference in the students exceeding the cut score under the partial credit model as compared with dichotomous scoring, but it did show that error of measurement was reduced near the cut score. The degree of misfit to the model was slightly increased for students near the cut score. Appendix A contains portions of the examination. Appendixes B, C, D, and E give analysis results. Thirty-eight graphs and 47 references are included. (SLD)

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# Analysis of Spring 1990 Field Tryouts of MEAP Essential Skills Mathematics Test Items Using a Partial Credit Model

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Running Head: Partial Credit Model

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## Introduction

The objectives of this study were to use Master's (1982) Partial Credit Model (PCM), a one-parameter Unidimensional Polychotomous Rasch Model (UPRM), to (1) reduce the error of measurement, especially for students near the cut score, and (2) permit the measurement to more accurately reflect the actual ability of student (particularly at scores at or below the "guessing" range) by reducing the degree of misfit from the UPRM for students near the cut-score.

In a conventional multiple-choice test item, there is one correct response and three or four incorrect responses, establishing a dichotomy in which some examinees are declared to have "passed" the item and all others are judged to have "failed" it. In developing test items, the incorrect response choices (foils) are often designed to represent different types or levels of errors which will lead a novice to conclude that one of the defective responses is actually the correct one. Since there is almost never a situation in which an examinee is either completely knowledgeable or completely incompetent, it is theoretically possible to design foils which form an ordinal scale, with each foil reflecting a degree of mastery relative to the attribute being tested.

By estimating the approximate competency level associated with each foil, a test can produce more information than one in which each answer is scored dichotomously as either "correct" or "incorrect." It has been recognized that this has particularly important implications in making pass/fail decisions in criterion- referenced measurement. The added information also has diagnostic value by enabling the measurement of partial mastery. Test scoring schemes which give credit for "partially correct" responses fit into many classifications; this study is based upon Master's (1982) Partial Credit Model (PCM), a one-parameter Unidimensional Polychotomous Rasch Model (UPRM).

## BACKGROUND

Over the past several years, traditional multiple-choice tests have been criticized for being narrow in scope and for providing information only at the knowledge and/or recall levels and giving little or no information about the

thought processes of the individual being tested (Stiggins & Bridgeford, 1985; Resnick & Resnick, in press). Shepard (1991) has noted that:

> Under pressure to raise test scores, the known limitations of multiple-choice tests have become greatly exaggerated. They become less valid indicators of what students know (because scores can go up without a commensurate gain in achievement); and more seriously, when multiple-choice tests become the focus of instructional effort, they have a negative effect on teaching and learning. (p. 21)

Despite these criticisms, multiple-choice tests continue to be an indispensable part of the assessment program in the schools. Since multiple-choice tests are easily scored by computer, they are efficient to use in addition to offering high reliability and validity. Several researchers have used polychotomous scoring to obtain more information about an individual's ability, while retaining the benefits of multiple-choice testing (Smith, 1987; Bock, 1972; Hambleton, *et al*, 1970). These authors have shown that the degree of correctness of an answer can be quantified and used as an additional source of information about an individual's ability.

Many teacher-made, hand-scored examinations (particularly at the secondary school and college levels) are graded to award credit for partially correct responses. In particular, examinations in mathematics, science, and engineering are often so scored (Crittendon, 1984). Polychotomous scoring can (1) provide more evidence of an examinee's partial development of the underlying trait, (2) improve the accuracy of the measurement, and (3) provide as much information with fewer items than would be needed for comparable results from dichotomous scoring (Haladyna, 1990). Furthermore, the diagnostic utility of the information obtained from partially correct responses has been demonstrated in several studies (Levine & Drasgow, 1983; Thissen, 1976).

Despite growing disenchantment among some educators with machine-scored multiple-choice tests (Gifford, *et al*, 1990), the efficiency and objectivity of these instruments provide strong incentives for continuing their use. In a study designed to determine whether open-ended items provide more predictive validity than dichotomously-scored multiple-choice items, chemical engineering students at Purdue University were examined with both grader-



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scored (open-ended) and machine-scored (multiple-choice) quizzes. It was found that (Kessler, 1988):

> ... grader-scored quizzes are not any better correlated (than machine-scored quizzes) with the usual grade-index criteria of student performance. ... Although there may be a difference in evaluations using quizzes designed for machine- and grader-scored testing, it appears that other variables are so much more important that they obscure any practical differences (p. 709).

In an effort to overcome the presumed limitations of dichotomously-scored multiple choice items, various methods of "differential option weighting" have been investigated (Yan, 1989). These include answer-until-correct, examinee's confidence weighting, distractor elimination, and response weighting. Each of these methods has been explored further using linear and non-linear models to determine the weights to be assigned to each option (Haladyna, 1988). Although there have been numerous techniques and formats developed to grant partial credit through various schemes, this paper is restricted to paper-and-pencil tests using standard multiple-choice items that have been administered under directions to "find the BEST answer." Logically, the correlation between each option choice and the total test score (the point-biserial coefficient) provides a measure of the degree of correctness of the option as viewed by those taking the test. One method for determining distractor weights, then, is to arrange the option choices in descending point-biserial order (cf. Haladyna, 1990, pp. 232f). A more comprehensive overview is included in Haladyna's (1988, 1990) papers.

Beyond the utility of partial credit scoring for instructional purposes, Haladyna (1990) has noted that:

> For any testing program intended for licensure, certification, competency, or proficiency, ... empirical option-weighting typically produced slightly more reliable domain score estimates and more consistent pass/fail decisions than number-correct scoring, particularly in the lower half of the test score distribution. (p. 231)

The 1979 Joint College Entrance Examination in Taiwan, Republic of China, used a "multiple answer" format in which there were several response options for each item, some of which were correct and some incorrect. To receive credit for an item, <u>all</u> response choices had to be marked correctly.

Data from administration of this test were later re-analyzed to give partial credit for students who misclassified one or more options on a given item (Hsu, 1984). The conclusion was that the tests were easier, more reliable, and more discriminating by granting partial credit, although the gains were small. The limited gains were attributed to "ceiling effects" because these tests were already very reliable and discriminating without the partial credit scoring.

Another example comes from a study of factors which influence the learning of classical mechanics . It was discovered that (Champagne *et al*, 1980):

> ... on the basis of common-sense world experiences, students often develop conceptions about the physical world which are strongly held and which interfere with the learning of new conceptual relationships during physics instruction. ... Instruction in classical mechanics can be improved by continuously encouraging the students to reject an Aristotelian system of beliefs and to adopt a Newtonian paradigm. (pp. 1074 and 1078)

Since paradigm shifts are usually resisted or entered into reluctantly (Kuhn, 1962), diagnosis of student progress in learning classical mechanics is strengthened by designing test items which recognize partial learning of the theoretical concepts of Newton as contrasted with the "common-sense" notions of Aristotle which students acquire early in life through their personal observations.

In a report on developments in the area of computerized adaptive testing (CAT) using partial credit scoring, it was noted that (Dodd *et al*, 1989):

> ... research with the graded response model suggests that it may be possible to implement CAT successfully using item pools that are substantially smaller than the pools required for dichotomous items. The apparent reason is that polychotomous scoring of items provides more information across the full range of the Q scale, which reduces the possibility that gaps will occur in the pool. (p. 141)

The fallacy of combining unrelated attributes into a single result is one of the most severe criticisms of common measurement "tools" like performance ratings, which have been used for many years in personnel evaluations and

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are currently widely touted as "authentic assessment." These instruments are prone to the flaw of "halo," in which the rater tends to appraise diverse characteristics as if they were common attributes. Supervisor's ratings tend to be unreliable because (Hunter & Schmidt, 1990):

> ... the idiosyncrasy of that supervisor's perceptions is a part of the error of measurement in the observed ratings. Extraneous factors that may influence human judgment include friendship, physical appearance, moral and/or life-style conventionality, and more (p. 65).

For example, police officers who are considered to be effective investigators may receive high ratings as report writers, while a less effective investigator who writes far superior reports (where the reports are judged anonymously) may be rated as a poor report writer. Few measurement instruments exist which can clearly measure and report *distinct* attributes of the subject being measured (Denny, 1990).

How does a test "earn the privilege" of being sound enough that its "scores" can be said to represent true "measurement?" *Unidimensionality* is clearly desirable if strong measurement conclusions are to be drawn about the scores obtained. Wright & Linacre (1989) have noted that:

> ... unidimensionality is a meaning of measurement. No actual test can be perfectly unidimensional. ... This reality is encountered by every science. Physicists' corrections for the unavoidable multidimensionalities they encounter are an integral part of their experimental technique. (p. 2)

To argue, however, that a measurement model is "robust to violations of unidimensionality" does not relieve one from responding substantively to questions about dimensionality. Wright & Linacre go on to state that:

> If a test containing a mixture of medical and law items is used to make a single pass-fail decision, then the examination board, however inadvertently, has decided to use the test as if it were unidimensional. ... Their unidimensional behavior does testify that they are making medicine and law exchangeable and hence identical there. (p. 3)

The issue of *unidimensionality* is critical to any discussion of measurement, but it is *especially* so in the case of the Partial Credit Model

(PCM). It would make very little sense, for instance, to give someone credit for partial understanding of medicine if one is using foils which represent partial knowledge of law. This should become clearer later in this presentation.

## Methodology

### Models

Rasch's dichotomous model for the probability of a correct response $F_{ni}$ by person *n* (with ability $b_n$) pitted against an item *i* (with difficulty $d_i$) is:

$$F_{ni} = \exp(b_n - d_i)/(1 + \exp(b_n - d_i)) \qquad (1)$$

An extension of simple right/wrong scoring consists of identifying one or more intermediate levels of performance on an item and awarding partial credit for reaching one of the intermediate levels (Wright & Masters, 1982, p. 40). The dichotomous Rasch model mav be generalized to a model for partial credit by representing each pair of adjacent response opportunities in a string of ordered categories as a dichotomous element governed by $\exp(b_n - d_{ij})/(1 + \exp(b_n - d_{ij}))$, where *j* indicates the step required in item *i* for person *n* to advance from the lower of the adjacent pair to the higher.

Thus, instead of a single equation defining the probability of a correct response, we have a family of equations representing the probability of an examinee selecting a given step of a 'scale' of response choices. The difficulty, $d_{ij}$, of the *j*th step of the *i*th item can be written as

$$d_{ij} = d_i + t_{ij}, \qquad (2)$$

where $d_i$ is the base difficulty of item *i* and $t_{ij}$ is the incremental difficulty (from the base) of the *j*th step. Therefore, the probability of a correct response is:

$$F_{nij} = \exp(b_n - (d_i + t_{ij}))/(1 + \exp(b_n - (d_i + t_{ij})) \quad j = 1, 2, \ldots, m_i \qquad (3)$$

### Instrumentation

Two implementations of the extended Rasch models were used in the

application of polychotomous scoring to the MEAP 1990 Spring mathematics item tryouts. They are FACETS (Wright & Linacre, 1990) and BIGSCALE (Wright & Linacre, 1989).

FACETS is a computer program which produces a Rasch analysis of many-faceted data through iterative maximum-likelihood estimations based upon models such as

$$\log () = Bn - (Di + Tj) \qquad (4)$$

where Bn is the ability of student n, Di is the difficulty of item i, and Tj is the step difficulty of response choice j. In quantitative terms, the probability of choosing the *k*th response category is

$$F_{nik} = \exp \sum_{j=0}^{k} (b_n - (d_i + t_{ij})) / \sum_{k=0}^{m} \exp \sum_{j=0}^{k} (b_n - (d_i + t_{ij})), \qquad (5)$$

where $t_{i0} \int 0$. FACETS was designed primarily for analyzing Likert-type rating scale data. It provides estimates of a difficulty parameter and a set of "threshold" values ($t_{ij}$) independently for each item. In effect, the program treats the set of response choices for each item as a unique rating scale, in which the worst response is given a rating of "-1" and the best response a rating of "+1." The other choices are positioned, by FACETS convention, along the scale between -1 and +1 through an iterative joint maximum likelihood method (Linacre, 1989). Other scale choices (i.e., other than -1 to +1) are available, however, and should be considered in future research.

The dichotomous analysis was made using BIGSCALE, a program which fits the one-parameter Rasch measurement model to the data. Results from the FACETS analysis were used to enter data into BIGSCALE for partial credit scoring with uniform steps for all items (i.e., using weights of 0, 1, 2, and 3 for the least desirable foil to the correct answer response, respectively).

Approximate *t*-statistics are computed by both FACETS and BIGSCALE, which summarize an individual's or an item's fit to the UPRM. A large positive fit statistic suggests that the person ability or item difficulty should be inspected for unexpected failures or successes (Wright & Masters, 1982). A large negative fit statistic indicates a consistent Guttman-like response pattern; a person with

statistic indicates a consistent Guttman-like response pattern; a person with such a fit statistic will have (a) correct scores on those items for which his ability is greater than the item difficulty, (b) incorrect scores for those items whose difficulties are above his ability, and (c) partial credit scores when his ability and item difficulties are approximately equal (Hillocks & Ludlow, 1984). Large negative fit statistics, then, demonstrate that the rating-scale property of the test items has been confirmed.

**Content Analysis**

This study examined the item responses of a sample of approximately 264 tenth grade students who were part of the Spring 1990 item tryout population for Form 3A1 of the MEAP Essential Skills Mathematics Tests. This test form included 134 items. Analysis of these items using FACETS showed that only 16 items had foils which appeared to represent varying degrees of understanding of the underlying concepts. (cf. Appendix A for the test items used in this study.)

Three examples will be used to illustrate the types of items which appear to fit the partial credit model. The first example (cf. Figure 6) asks:

2. Which of these numbers has the GREATEST value?

**A** $6.575 \times 10^{-3}$

**B** $1.27 \times 10^{-2}$

**C** $5.40 \times 10^{-4}$

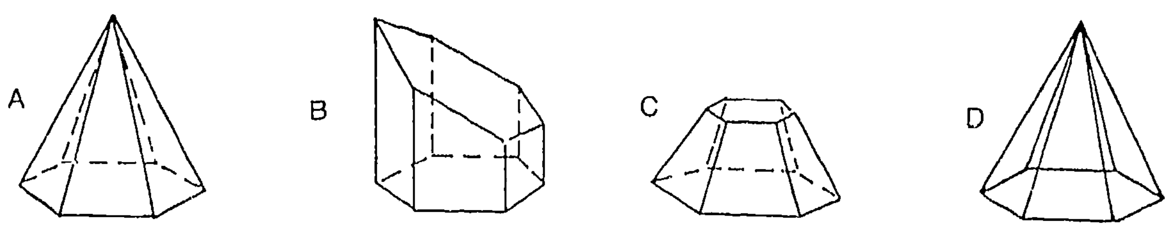
**D** $5.01 \times 10^{-1}$

"**D**" is the correct response, since $10^{-1}$ is the highest exponent and all of the numbers are stated in proper scientific notation (i.e., all of the numbers are stated in the form $\mathbf{X \times 10^{n}}$, where **X** is a decimal between 1 and 10 and **n** is the power of 10 which, when multiplied by **X**, gives the value of the number). **C** would attract those who do not know the meaning of the *minus sign* before the exponent, whereas **A** is designed to attract the student who does not

understand exponents and only looks at the **X** values in the response choices. **B** appears to be a "throw-away," since one would need to lack a fundamental understanding of the meaning of the word "GREATEST" to select this response. This item had a *p*-value of 0.50, and a point-biserial correlation of 0.49. **C** and **A** were each selected by about 21% of all the examinees, with the more able choosing **C** and the less able, **A**. Only 6% of all examinees chose **B**. Among the bottom 40% of the students, **A** was the favorite choice, while **C** was next highest.

Another example (Figure 8) asks:

45. Which of these is an appropriate drawing of a hexagonal pyramid?




For this example, **A** is the correct ("appropriate drawing") answer. **C** is close to being correct, but it is a *truncated* hexagonal pyramid. **D** could easily be chosen by an examinee who did not understand that lines which cannot be seen from the vantage point of the observer are shown as *dashes*. **B** is not even a pyramid. This item had a *p*-value of 0.41, and a point-biserial correlation of 0.4?. **C** was selected by 25% of all examinees, **D** by 19%, and **B** by 10%. Among the bottom 40% of the examinees, **C** was the top choice, while **D** was favored by the middle 20% of the group.

The final example, in Figure 9, asks:

56. What is the probability of getting three heads in a row tossing a fair coin?

**A** 3/2 **B** 1/2 **C** 1/4 **D** 1/8

**D** is the correct answer. **B** is plausible to examinees who think only of the probability of getting *heads* on a single toss of a coin, while **A** indicates a moderate understanding of the problem but a misunderstanding of how to compute the joint probability (i.e., the probability of a 50-50 event occurring three times in a row, which is .50 * .50 * .50, not .50 + .50 + .50). This item had a *p*-value of 0.22 and a point-biserial correlation of 0.41. **B** was selected by 32% of all examinees, and was the favored choice of all but the top quintile (which chose **D**, the correct answer).

## Data Analysis

Part (a) of Figures 4 through 21 are Item Characteristic Curves (ICCs) which illustrate how students with different raw scores on the 16-item testlet performed on the items which appeared to produce "partial credit" information. The numbers on each vertical axis represent the proportion of students in each respective quintile who selected each of the 4 answer choices. Part (b) of each figure is an "Item Response Map" which is an alternative method for presenting the data from Part (a) using the cumulative proportions responding to the items. The advantage of the Item Response Map is that it demonstrates whether or not the response categories actually form a "scale" of logistic Item Characteristic Curves, such as those illustrated in Figure 1(b). In each case, the numbers along the horizontal axis represent groups of students in the five quintiles of total raw scores. The correct option is shown in parentheses for each item.

The analysis of the test results indicated that these sixteen items produced moderately reliable results for a very difficult test, independent of scoring technique, with KR-20 being about .73 for all three analyses performed. Elaborating on this conclusion, the following subsections describe the results from dichotomous and polychotomous scoring of the sixteen-item "testlet." In order to provide a moderately stringent test of the PCM, a cut score of 25% correct was chosen for this study. This places some of the examinees who passed the test in the guessing range, since four options per item produces a guessing level of 25% correct. Since errors of measurement and model misfit most severely affect students in the low-score range of a test, this situation simulates Haladyna's (1990) conditions. For students near the cut score, comparisons are made of classification results, testlet reliability, and misfits to

the UPRM.

In order to compare results of dichotomous and PCM scoring, the cut score was set for all three analyses using equipercentile scaling. This produced a passing score of four items correct (out of 16 possible) on the dichotomously scored analysis, and 35 points (out of a possible 48) on the PCM-scored analyses.

**BIGSCALE Dichotomous Scoring Analysis**

BIGSCALE uses an iterative unconditional maximum likelihood procedure to determine the best-fit logistic curve for the test results. After a satisfactory fit is obtained, the program computes a modified *t*-statistic on each item response curve and each person's response pattern to determine how well each item and examinee fits the model. Since the test checks the fit of the item (or person) to the model, a two-tailed test is used (critical value is $t = 1.960$, $a = .05$).

For the sixteen-item testlet, two items produced fit statistics which exceeded the critical value (cf. Appendix B, p. B-7). Items 62 (Figure 13, Area Problem) and 92 (Figure 16, Robot Selection) were very difficult items which elicited random-like responses from nearly all but the highest-scoring students.

Four persons (out of 262 tested) had fit statistics which exceeded the critical value (Appendix B, p. B-6). Students 18, 74, 110, and 131 had item response patterns which were 0000010000100011, 0010110011001100, 1000100010101011, and 1000011011011100 (compared with an expected pattern such as 1111111100000000, where the items are arranged from easiest to most difficult; 1 represents "correct," and 0 represents "incorrect"). These students missed at least 5 of the 8 easiest items, and got at least 4 of the 8 most difficult items correct. In contrast, student 217 had a fit statistic of 0 (response pattern = 1001111100001000), and student 256 had a statistic of -2.2 (pattern = 1111111010000000). The more negative the fit statistic, the closer the student's response pattern approximates a Guttman scale (i.e., a string of 1's followed by a string of 0's).

A large negative *t*-statistic does represent a misfit to the Rasch model, which could theoretically cause prediction errors for students whose ability levels are not close to the difficulty level of the item. Item 18 (Figure 5) is an

example of such an item with a large negative $t$-statistic and a difficulty calibration of 0.28 logits. Students with ability calibrations of .30 logits (the closest to the item calibration value) performed exactly as the model predicts on this item, with 54% getting the item right (N=13 students). Students with ability levels .7 logits above or below the item difficulty should score 75% correct and 25% correct, respectively; the actual figures are 75% correct (ability = .95 logits; N=20) and 0% correct (ability = -.31 logits; N=14). The model fit is still good for the more able students, but totally wrong for the less able examinees.

At the student level, the strong Guttman-like response of student 256 (pattern = 1111111010000000) is a good example. As a student encounters items on the test which most closely match his or her ability level, there is a 50-50 chance of a correct response. For a Guttman-like response, student 217 (with a fit-statistic of 0) would have been expected to get the first 7 items correct and the last 9 items incorrect. With the BIGSCALE analysis, the first item and the last three items received the expected responses (1 and 0, respectively); the middle 10 items form a Guttman scale; the intervening two items (second and thirteenth) received unexpected responses. Since the fit statistic is zero for this student, the response pattern reflects a very good fit to the Rasch model.

Altogether, 10.6% of the students in this sample exhibited a Guttman-scale response pattern with $t<-1$ (Appendix B, p. B-1). Another 10% had $t>1$, indicating a moderate lack of fit to the Rasch model, including 1.5% with fairly severe misfit ($t>1.96$). The remainder fit the model very well. Of the students at the 25th percentile (scoring 4 out of 16 items correct), the average $t$-statistic was +.48 with a mean-square error of .63 logits.

**BIGSCALE Partial Credit Scoring Analysis**

In the BIGSCALE Partial Credit Model analysis, there were four items (out of 16 tested) which had fit statistics which exceeded the critical value (cf. Appendix C, p. C-7). Item 91 (Figure 15, Hydrogen Peroxide) was a very difficult item which seemed to elicit almost random responses from all but the highest-scoring students, while items 10 (Figure 6, Income/Expense Trend) and 15 (Figure 7, Sum of -3, -15) were very easy. Item 62 (Figure 13, Area Problem) was of moderate difficulty.

Response patterns were generated for each student, with items



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arranged in order of easiest to most difficult. Seven persons (out of 262 tested) had fit statistics which exceeded the critical value. These were students 58, 199, 5, 110, 108, 3, and 227, whose response patterns were 032022300203213, 032202030032122 3, 000200113032002 2, 301133012033232 3, 3302 00 00200303, 312101033032133 2, and 331333013300213 3, (compared with a Guttman-like 333222221111000; **3** represents "fully correct", **2** "high-partially correct", **1** "low-partially correct", **0** represents "incorrect," and **blank** means the item was skipped). These students selected the "incorrect" (worst) response for at least 3 of the 8 easiest items, and got at least 2 of the 8 most difficult items "fully correct." In contrast, student 65 had a fit statistic of 0 (response pattern = 313332232032122 3), and student 219 had a statistic of -2 (pattern = 333311112122122 2). The more negative the fit statistic, the closer the student's response pattern comes to being a perfect Guttman scale (i.e., a string of 3's, followed by a string of 2's, followed by a string of 1's, followed by a string of 0's).

Altogether, 10.7% the students in this sample exhibited a Guttman-scale response pattern with $t$<-1 (Appendix C, p. C-1). Another 15.3% had $t$>+1, indicating a moderate lack of fit to the Rasch model, including 2.7% with a severe misfit, $t$ > 1.96 (Appendix C, p. C-6). The remainder fit the model very well. Of the students scoring at the 25th percentile (25 points out of a possible 48), the average $t$-statistic was +.88 with a mean-square error of .24 logits. Note that the logit error (variability) decreased by 62% from the dichotomous value, while the $t$-statistic (goodness-of-fit) increased by 83%. Therefore, the measurement precision increased significantly, at the expense of decreased fit to the Rasch model.

**FACETS Rating Scale Analysis**

In the FACETS Rating Scale Model analysis, there was one item (out of 16 tested) with a fit statistic which exceeded the critical value (cf. Appendix D, p. D-7). Item 91 (Figure 15, Hydrogen Peroxide) was a very difficult item which severely misfitted the model for seven students (3% of the sample).

Twenty-eight persons (out of 262 tested) each had a fit statistic on one item which exceeded the critical value (Appendix D, p. D-6). Five students had high overall $t$-statistics indicating severe misfit to the model. These were among the same students who misfitted the BIGSCALE Partial Credit Model.

Altogether, 13.4% of the students in this sample exhibited a Guttman-scale response pattern with $t<-1$ (Appendix D, p. D-1). Another 15.3% had $t>+1$, indicating a moderate lack of fit to the Rasch model. (FACETS does not produce the same precision on the *t*-statistic as BIGSCALE produces.) Only 2% of the students had fit statistics which exceeded the critical value. The remainder fit the model very well. Of the students scoring at the cut-score of 25 out of 48 points, the average *t*-statistic was +.60 with a mean-square error of .24 logits. Note that the logit error was decreased by 62% just as it was with the BIGSCALE Partial Credit analysis, while the *t*-statistic was increased by 25%. Therefore, the precision of measurement was the same with FACETS and the BIGSCALE Partial Credit analysis, but the fit to the Rasch model is much better using FACETS.

## Discussion

### Results

The FACETS Rating Scale Analysis and the BIGSCALE dichotomous and PCM analyses of the 16-item testlet at the *item* level showed item-separation reliabilities of 0.96; at the *person* level, there was a person-separation reliability of .73 (cf. Appendix E).

Four students (1.6%) "passed" the test under the PCM who had "failed" under dichotomous scoring. Also, nine students (3.5%) "failed" the test under the PCM who had "passed" under dichotomous scoring. The average fit statistics for the newly passing students were reduced from -.35 to -.83, indicating better fit to the model. For the newly failing students, however, the average fit statistic *increased* from .51 to .88, meaning that the students who were "demoted" under PCM scoring experienced a greater degree of misfit than they did under dichotomous scoring. Overall, 5.1% of the students had their classification changed under PCM scoring and experienced an average increase of .10 in *t*-statistic (to an average *t* of +.13). Thus, the fit statistic for low-scoring students was not reduced using the PCM scoring, disconfirming the second hypothesis.

Overall, the root-mean-square error using dichotomous scoring was 0.70; using the BIGSCALE PCM scoring, it was reduced to 0.37, close to the value of 0.38 obtained using the FACETS Rating Scale Model. At the cut-score (the 25th percentile), the RMS error with dichotomous scoring was 0.63 logits; the

BIGSCALE PCM and Facets Rating Scale Analysis RMS error at the cut-score was 0.24 logits. This confirmed the first hypothesis (that the error of measurement at the cut-score was reduced using the Partial Credit Model).

## Impact

Although the present analysis did not show a major difference in the students exceeding the cut-score under PCM as compared with dichotomous scoring (a difference of only 5.1%), it did show that the error of measurement was reduced near the cut-score, while the degree of misfit to the model was slightly increased for students near the cut-score. These results have potential practical significance for decisions regarding student performance.

Had the test been designed for PCM scoring, and had it not been quite so difficult (and embedded within a much larger test), it is possible that the results might have been more conclusive.



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**Limitations**

The results of this study are limited because the test instrument which was used was not designed with the Partial Credit Model in mind. Preliminary analysis of the point-biserials indicated, however, that several of the items produced item characteristics similar to those needed for the partial credit model to work. About an eighth of the items in the test appeared to lend themselves to partial credit scoring. Even among cases where the items fit the partial credit model, the discrimination among the foils was too small to constitute <u>different</u> (and perhaps discrete) stages of learning.

Another limitation is the implied assumption that thinking processes are discrete and that there is a unique way to obtain the correct answer. Current developments in cognitive research indicate that there are multiple ways to approach a problem (Resnick & Resnick, in press), so this must be considered when developing foils for test items. Items which have non-unique approaches to their solutions may not lend themselves well to partial credit scoring.

In addition to these limitations, the results can be generalized only to a 10th-grade population such as that used in the MEAP 1990 spring item tryouts. Since the test was also used with 9th graders, it is possible that further analysis could determine that the findings apply to younger test-takers as well.

## Recommendations

This study demonstrated that, for the data set used in the analysis, the error of measurement at the cut-score was reduced using the PCM, whereas the fit to the Rasch model was not improved with partial credit scoring. It is postulated that the fit to the PCM was not improved because the items were not designed with partial credit in mind. To eliminate this concern, the study should be extended using test items designed for PCM scoring. At the same time, that the items should be administered as a stand-alone unit, not as part of a larger test.

Since the PCM can be implemented easily using computer software, the quality of decisions could be improved relatively easily in large-scale assessments using such a scoring regimen. With the continuing growth of state

assessment programs, and the prospect for a national examination, the efficiency of multiple-choice testing and the information quality of PCM could be combined to provide useful diagnostic information. This information could be used on the large scale for curriculum planning, and at the individual student level for individual pupil diagnosis.

This study did not consider whether or not the foils actually represented ordinal scales of learning or performance, and no information was available on external measures of student performance. Estimates of test score validity need to be obtained, to see if the PCM provides improved measurement over that provided by similar dichotomously-scored instruments.

## References

AERA, APA, & NCME (1985). *Standards for Educational and Psychological Testing.*

Andrich, D. (1978). A rating formulation for ordered response categories. *Psychometrika, 43,* 561-573.

Bauer, E. L. (1989). Sense and nonsense about school quality indicators. Unpublished manuscript. Oakland Schools.

Ben-Shakhar, G., & Sinai, Y. (1991). Gender differences in multiple-choice tests: The role of differential guessing tendencies. *Journal of Educational Measurement, 28,* 23-35.

Bock, R. D. (1972). Estimating item parameters and latent ability when responses are scored in two or more nominal categories. *Psychometrika, 37,* 29-51.

Carpenter, T. P., & Moser, J. M. (1984). The acquisition of addition and subtraction concepts in grades one through three. *Journal for Research in Mathematics Education, 15,* 179-202.

Champagne, A.B., Klopfer, L.E., & Anderson, J.H. (1980). Factors influencing the learning of classical mechanics. *American Journal of Physics, 48,* 1074-1079.

Champagne, A.B., Klopfer, L.E., & Gunstone, R.F. (1982). Cognitive research and the design of science instruction. *Educational Psychologist, 17,* 31-53.

Choppin, B. H. L. (1985). Lessons for psychometrics from thermometry. *Evaluation in Education, 9,* 9-12.



ERIC

Crittendon, J. B. (1984). Partial credit: Not a God-given right. *Engineering Education*, 288.

De Ayala, R.J., Dodd, B.G., & Koch, W.R. (1991). Partial Credit Analysis of Writing Ability. *Educational and Psychological Measurement*, *51*, 103-114.

Denny, G. S. (April, 1990). A comparison of rater calibration methods. Paper presented at the annual meeting of the American Educational Research Association, Boston.

Dodd, B.G., Koch, W.R., & De Ayala, R.J. (1989). Operational characteristics of adaptive testing procedures using the graded response model. *Applied Psychological Measurement*, *13*, 129-143.

Donlon, T.F., & Fischer, F.E. (1968). An index of an individual's agreement with group-determined item difficulties. *Educational and Psychological Measurement*, *28*, 105-113.

Duncan, O. D. (1984). **Notes on social measurement: Historical & critical.** NY: Russell Sage Foundation.

Ebel, R.L. (1968). Blind guessing on objective achievement tests. *Journal of Educational Measurement*, *5*, 321-325..pa

Ferrara, S., & Walker-Bartnick, L. (1989). Constructing an essay prompt bank using the partial credit model. Paper presented at the annual meeting of the National Council on Measurement in Education, San Francisco, 1989.

Fisher, G.H. (1987). Applying the principles of specific objectivity and of generalizibality to the measurement of change. *Psychometrika*, *52*, 565-587.

Gifford, B. R., Madaus, G. F., *et al* (1990). *From Gatekeeper to Gateway: Transforming Testing in America.* Chestnut Hill, MA: National Commission on Testing and Public Policy.

Haladyna, T. M. (April, 1988). Empirically based polychotomous scoring of multiple-choice items: A review. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, 1988.

Haladyna, T. M. (1990). Effects of empirical option weighting on estimating domain scores and making pass/fail decisions. *Applied Measurement in Education*, *3*, 231-244.

Hambleton, R. K., Roberts, D. M., & Traub, R. E. (1970). A comparison of the reliability and validity of two methods of assessing partial knowledge on multiple choice tests. *Journal of Educational Measurement*, *7*, 75-82.



ERIC

Hillocks, G., & Ludlow, L.H. (1984). A taxonomy of skills in reading and interpreting fiction. *American Educational Research Journal, 21*, 7-24.

Hunter, J. E., & Schmidt, F. L. (1990). **Methods of Meta-Analysis: Correcting Error and Bias in Research Findings**. Newbury Park, CA: Sage Publications, Inc.

Hsu, T.C., Moss, P.A., & Khampalikit, C. (1984). The merits of multiple-answer items as evaluated by using six scoring formulas. *Journal of Experimental Educction, 52*, 152-158.

Jansen, P.G.W., and Roskam, E.E. (1986). Latent trait models and dichotomization of graded responses. *Psychometrika, 51*, 69-91.

Kessler, D. P. (April, 1988). Machine-scored versus grader-scored quizzes - An experiment. *Engineering Education*, 705-709.

Kirst, M.W. (1991). Interview on assessment issues with Lorrie Shepard. Educational Researcher, 20, 21-23.

Kuhn, T.S. (1962). *The structure of scientific revolutions.* Chicago: University of Chicago Press.

Levine, M., & Drasgow, F. (1983). The relation between incorrect option choice and estimated ability. *Educational and Psychological Measurement, 43*, 675-685.

Linacre, J. M. (1989). FACETS: Many-faceted Rasch analysis with FACFORM data formatter. (Program manual.) Chicago: MESA Press.

MacRae, D.J., & Green, D.R. (1971). Comment on Fry's "Orangoutang Score." *The Reading Teacher, 24*, 364.

Masters, G. N. (1982). A Rasch model for partial credit scoring. *Psychometrika, 47*, 149-174.

Masters, G.N. (1988a). Measurement models for ordered response categories. Chapter 1 in **Latent trait and latent class models**, R. Langeheine & J. Rost (Eds.). New York: Plenum Press.

Masters, G. N. (1988b). The analysis of partial credit scoring. *Applied Measurement in Education, 1*, 279-298.

Masters, G.N., & Wright, B.D. (1984). The essential process in a family of measurement models. *Psychometrika, 49*, 529-544.

O'Connor, J. (1940). Unsolved business problems. Boston: Johnson O'Connor Research Foundation.

Resnick, L. B., & Resnick, D. P. (In press). Assessing the thinking curriculum: New tools for educational reform. To appear in Gifford, B. R., and O'Connor, M. C. (Eds.), **Future assessments: Changing views of aptitude, achievement, and instruction**. Boston: Kluwer Academic Publishers.

Rosenshine, B. (1980). Skill hierarchies in reading comprehension. In Shapiro, R.J., Bruce, B. C., & Brewer, W. F. (Eds.), **Theoretical issues in reading comprehension**. Hillsdale, NJ: Lawrence Erlbaum Associates.

Sax, G. (1962). Theoretically derived chance scores and their normative equivalents on a selected number of standardized tests. Educational and Psychological Measurement, 22, 573-576.

Smith, R. M. (1987). Assessing partial knowledge in vocabulary. *Journal of Educational Measurement, 24,* 217-231.

Stiggins, R. J., & Bridgeman, N. J. (1985). The ecology of classroom assessment. *Journal of Educational Measurement, 22,* 271-286.

Thissen, D. J. (1976). Information in wrong responses to Raven's Progressive Matrices. *Journal of Educational Measurement, 13,* 201-214.

Wright, B. D., & Linacre, J. M. (1989). The differences between scores and measures. *Rasch Measurement SIG Newsletter, 3,* 1-4.

Wright, B. D., & Masters, G. N. (1982). **Rating Scale Analysis**. Chicago: MESA Press.

Yan, J. (1989). Differential option weighting for multiple-choice test items. Unpublished paper.

Ziller, R.C. (1957). A measure of the gambling response-set in objective tests. *Psychometrika, 22,* 289-292.



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Figure 1(a). Item Characteristic Curves

6 + 8 = ? (Masters, 1988)

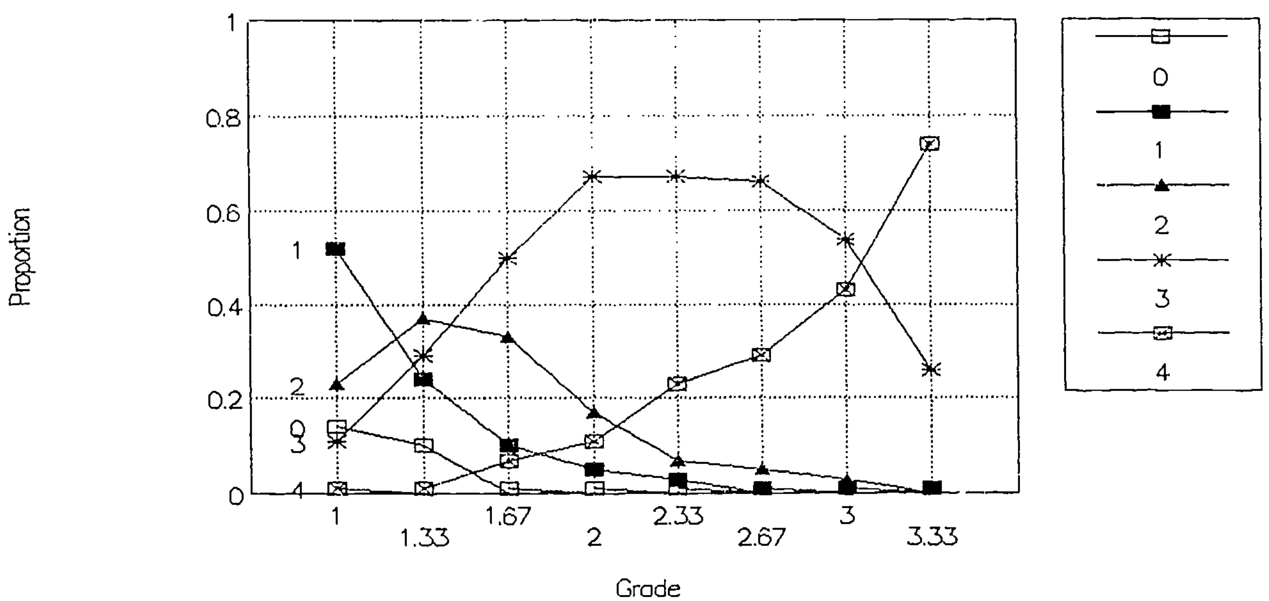



Figure 1(b). Item Response Map

6 + 8 = ? (Masters, 1988)

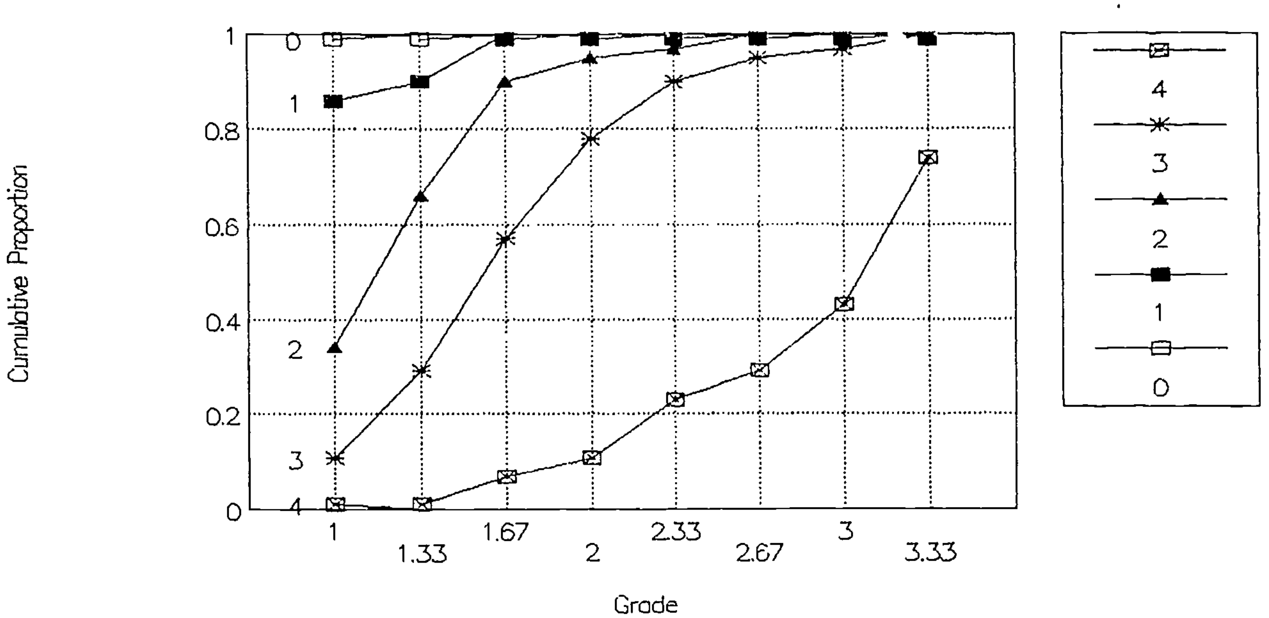


Figure 2(a): Masters' PCM

Item Characteristic Curves

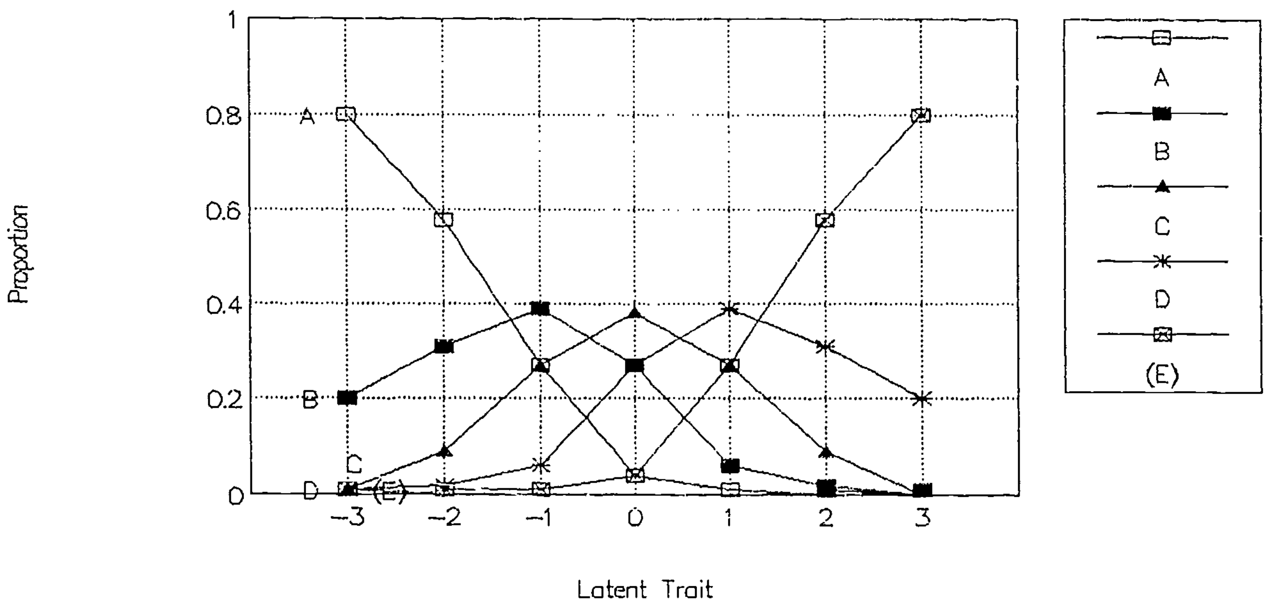
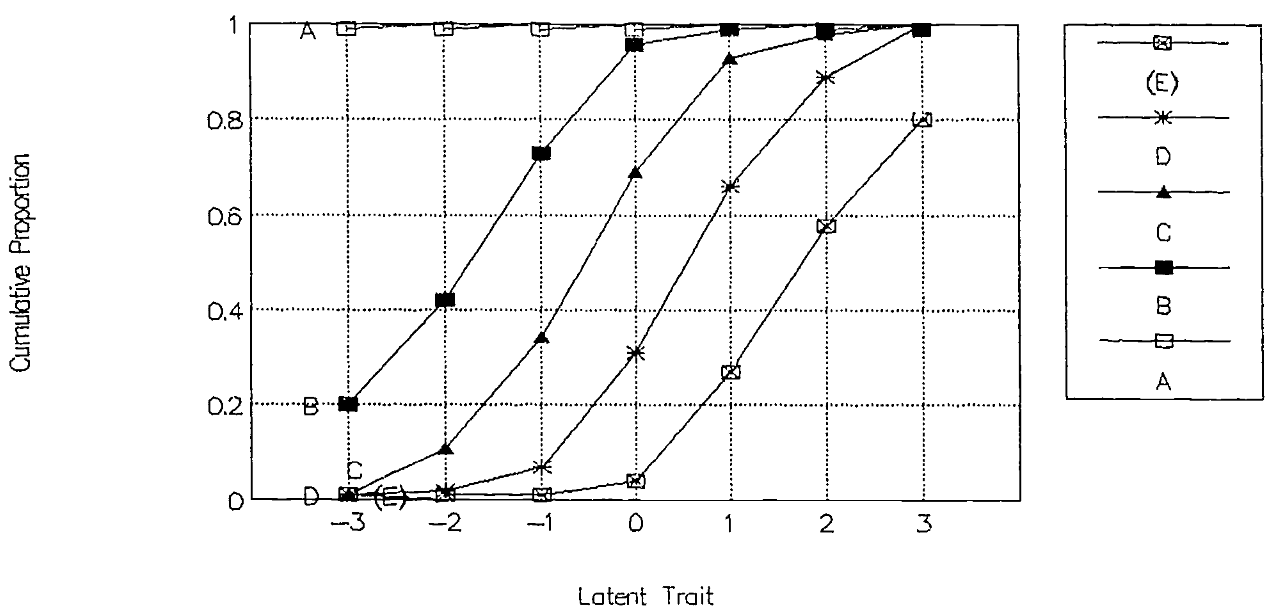
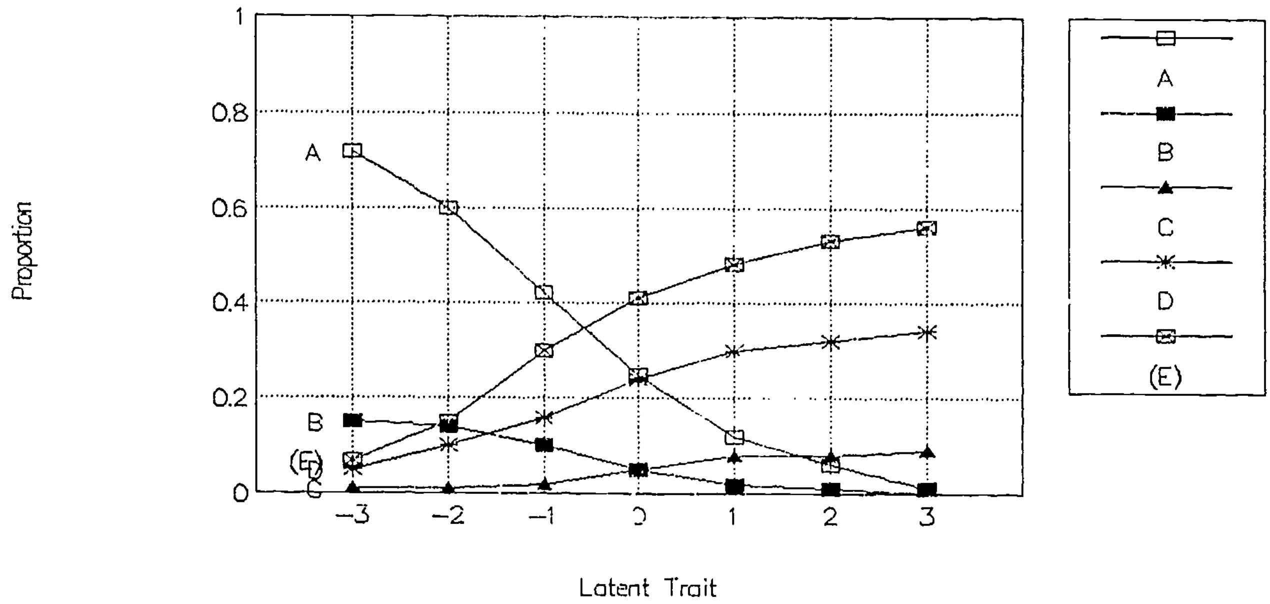



Figure 2(b): Masters' PCM

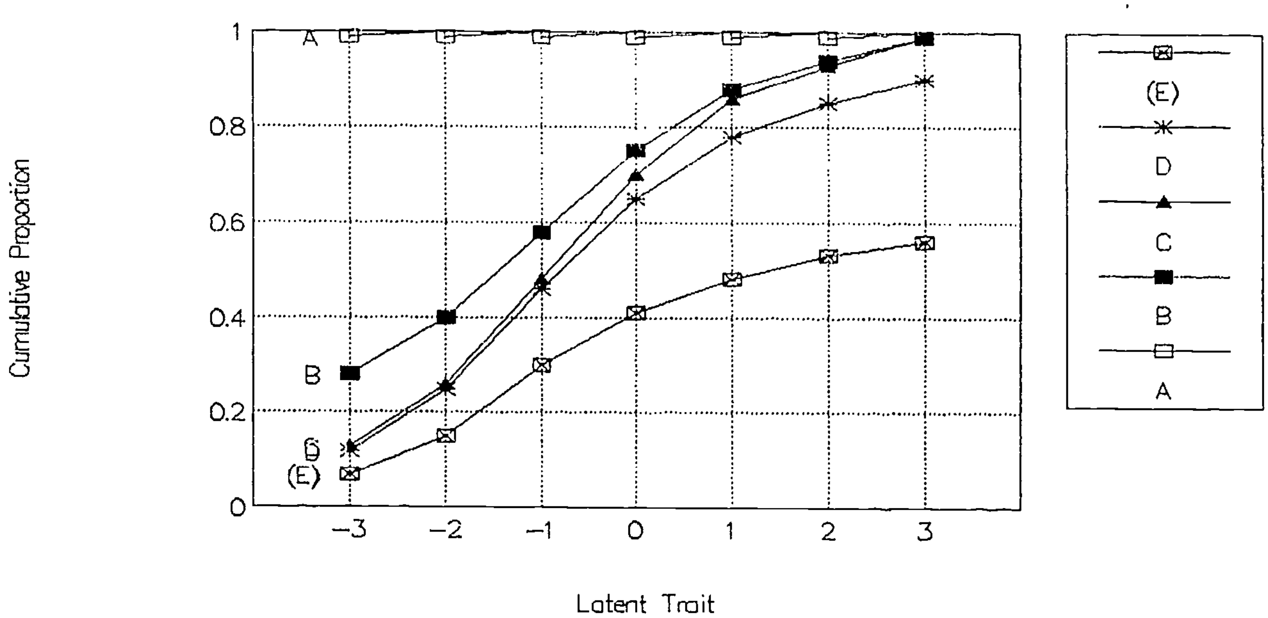
Item Response Map



## Figure 3(a): Jansen & Roskam Item Characteristic Curves




## Figure 3(b): Jansen & Roskam Item Response Map



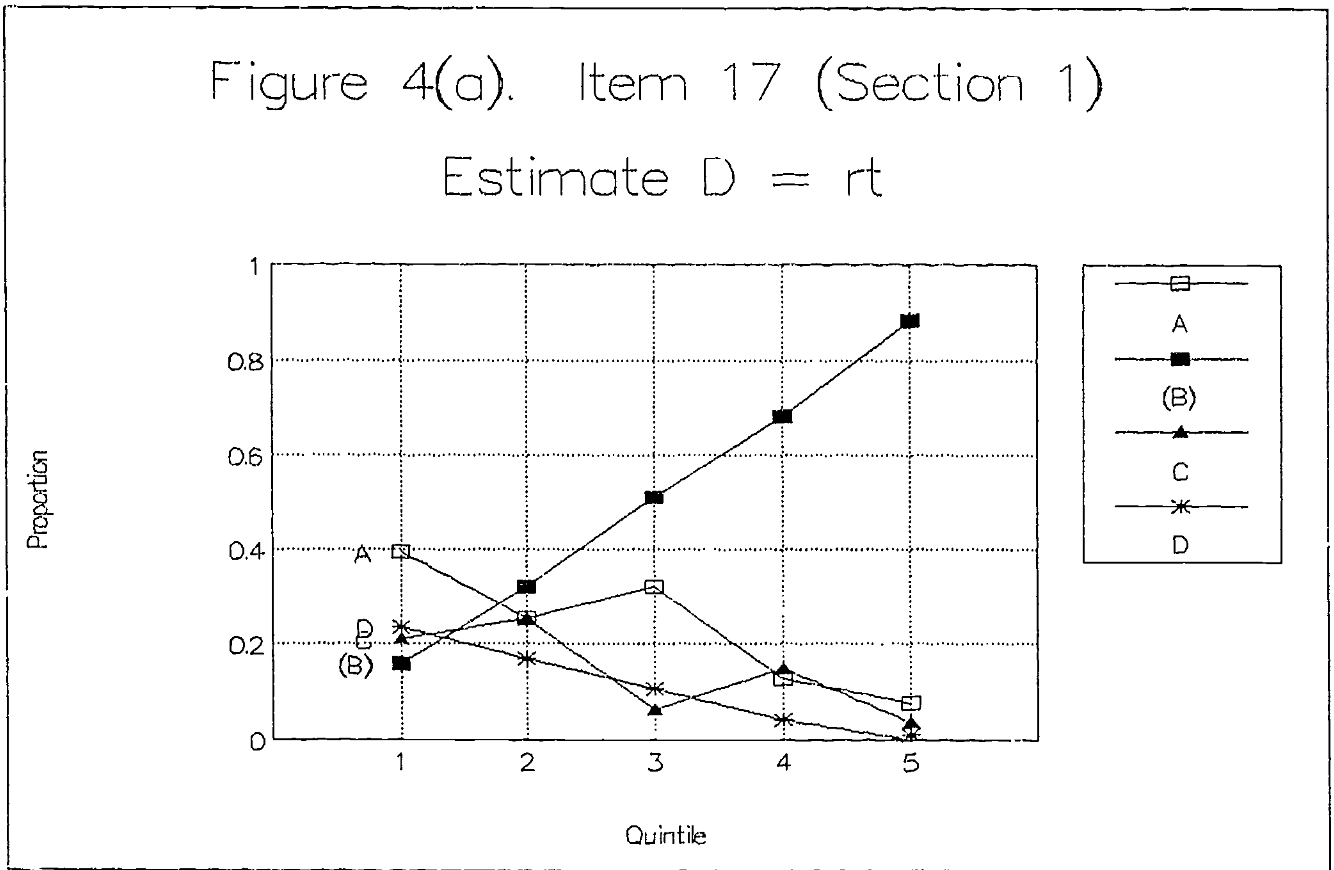


Figure 4(a). Item 17 (Section 1)
Estimate D = rt
Proportion
1
0.8
0.6
0.4
0.2
0
A
D
(B)
1
2
3
4
5
Quintile
A
(B)
C
D

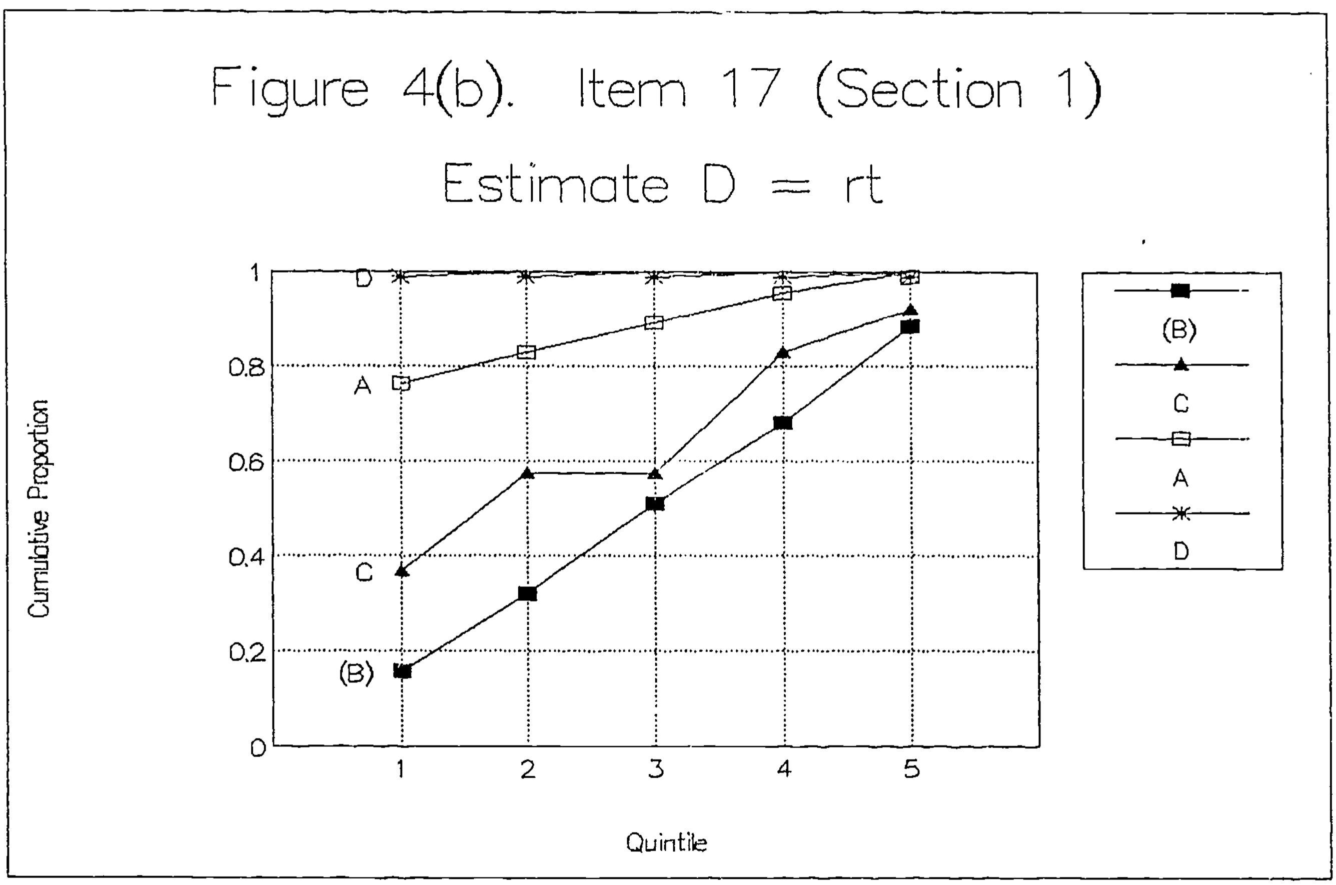


Figure 4(b). Item 17 (Section 1)
Estimate D = rt
Cumulative Proportion
1
0.8
0.6
0.4
0.2
0
D
A
C
(B)
1
2
3
4
5
Quintile
(B)
C
A
D

Figure 5(a). Item 18 (Section 1)

Square Root of 2501

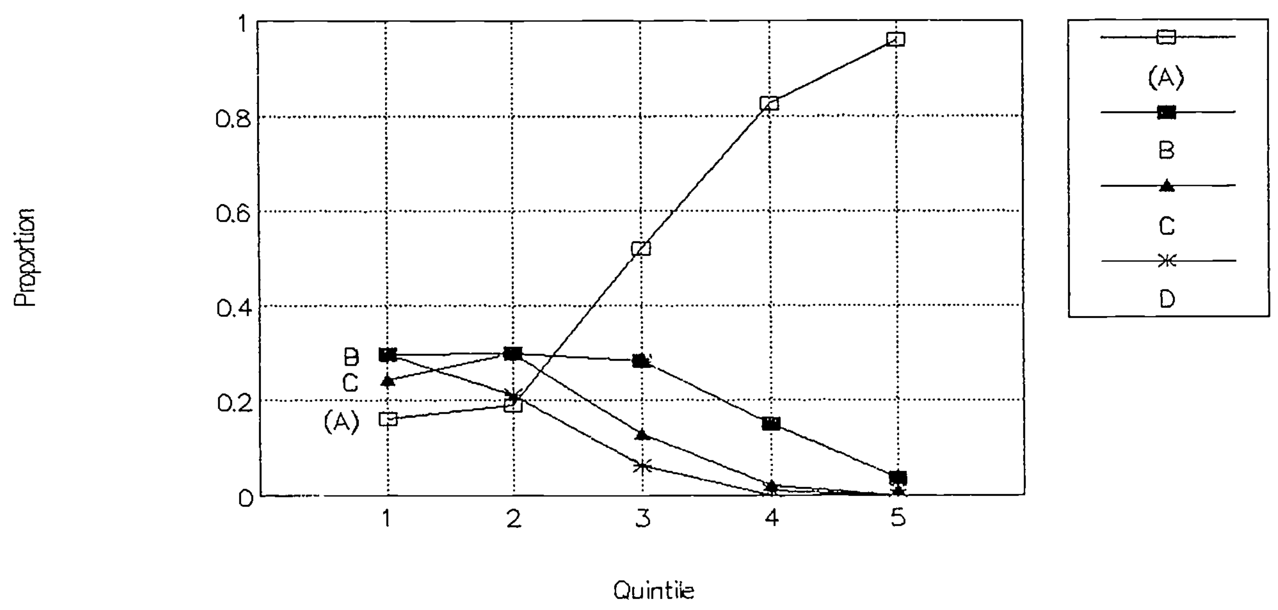
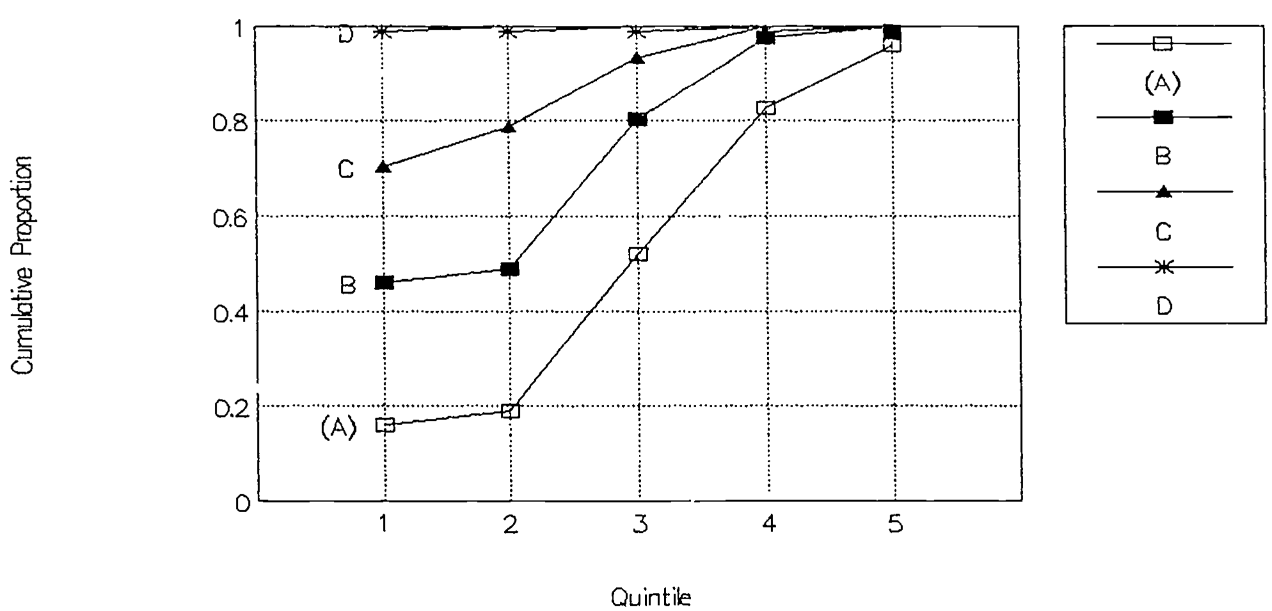



Figure 5(b). Item 18 (Section 1)

Square Root of 2501



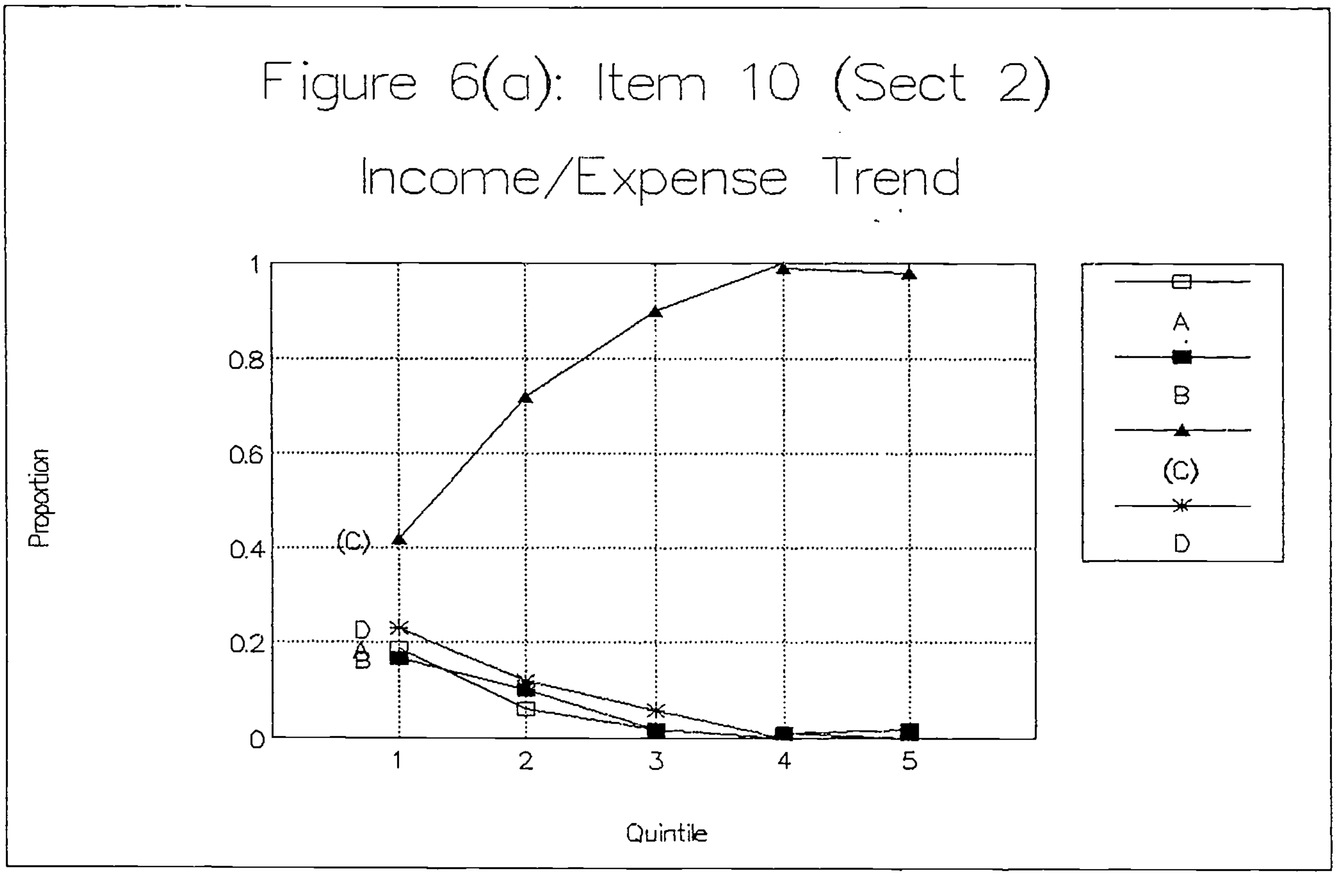


Figure 6(a): Item 10 (Sect 2)
Income/Expense Trend
Proportion
Quintile
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
(C)
D
A
B
A
B
(C)
D

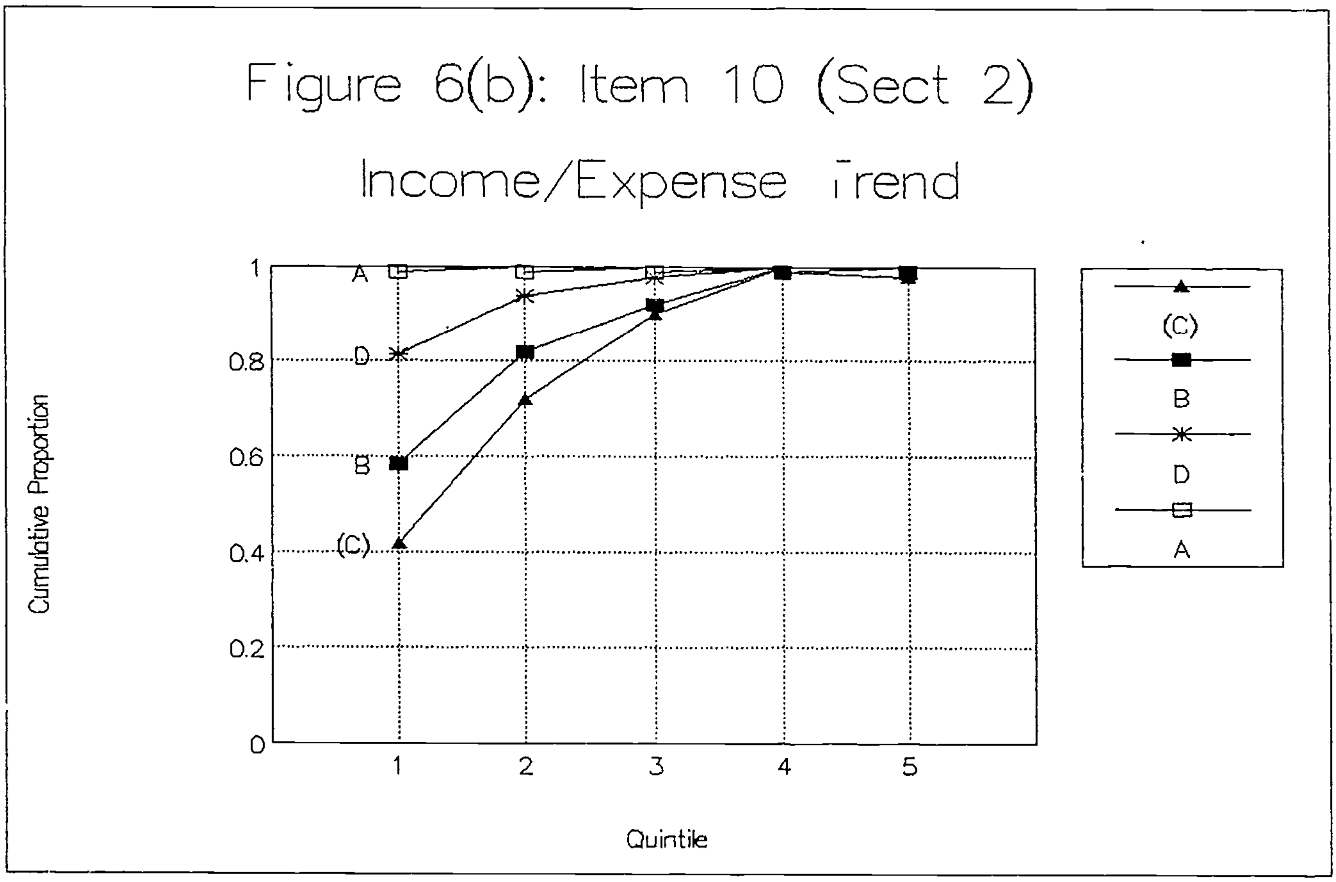


Figure 6(b): Item 10 (Sect 2)
Income/Expense Trend
Cumulative Proportion
Quintile
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
A
D
B
(C)
(C)
B
D
A

Figure 7(a): Item 15 (Sect 2)

Sum of (−3, −15)

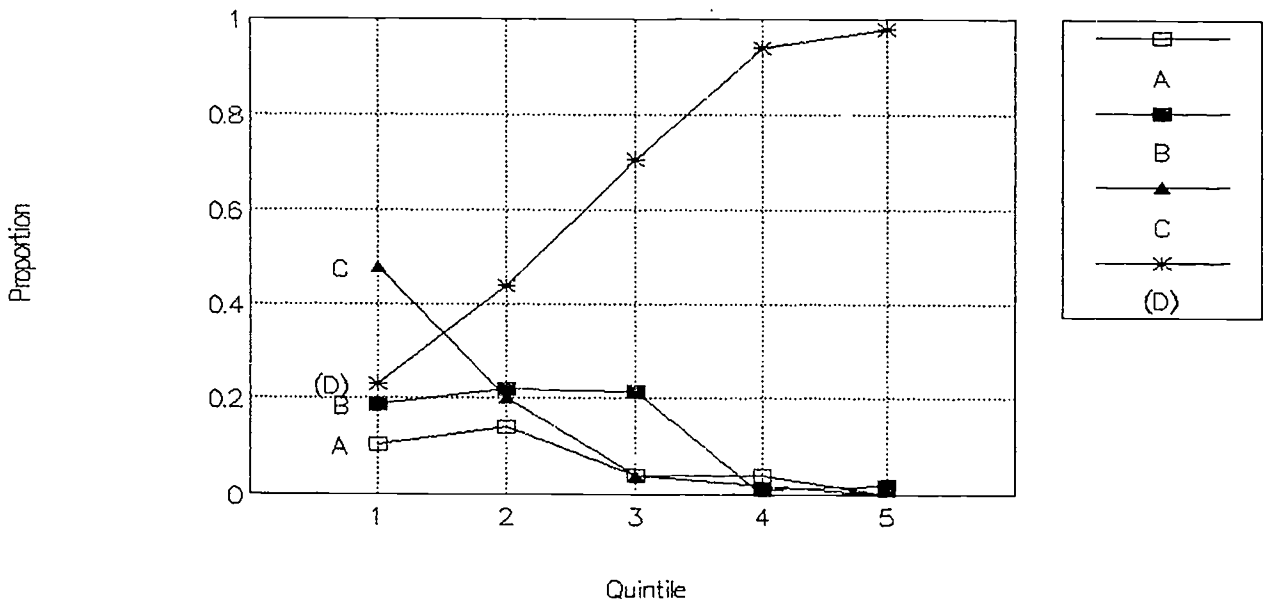
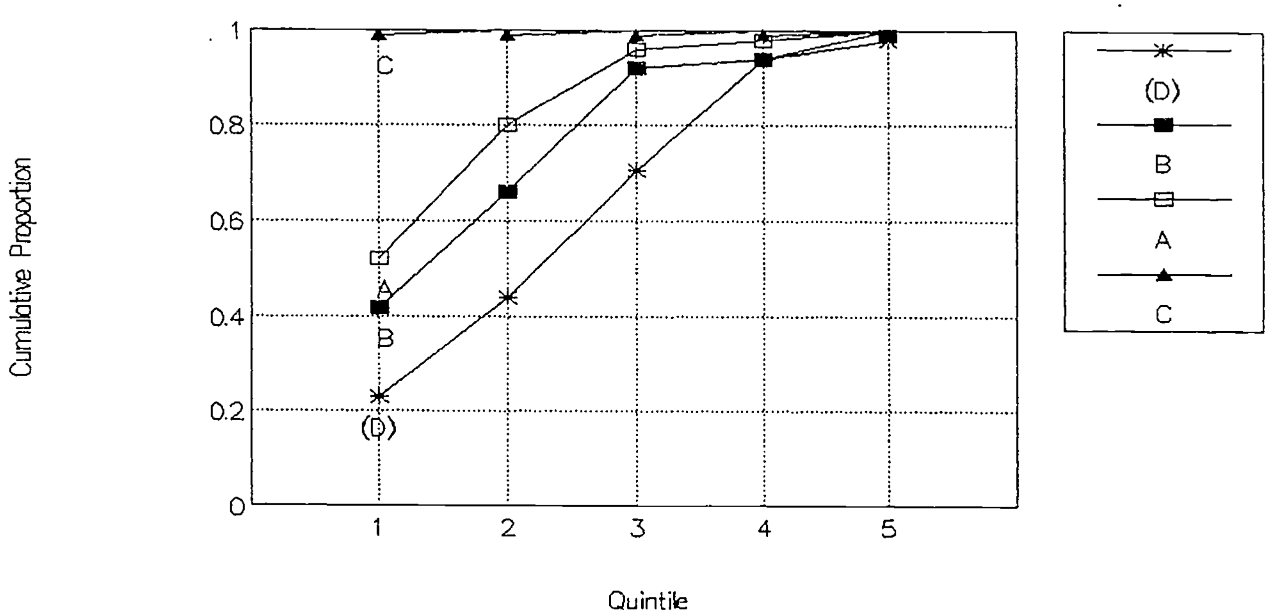



Figure 7(b): Item 15 (Sect 2)

Sum of (−3, −15)



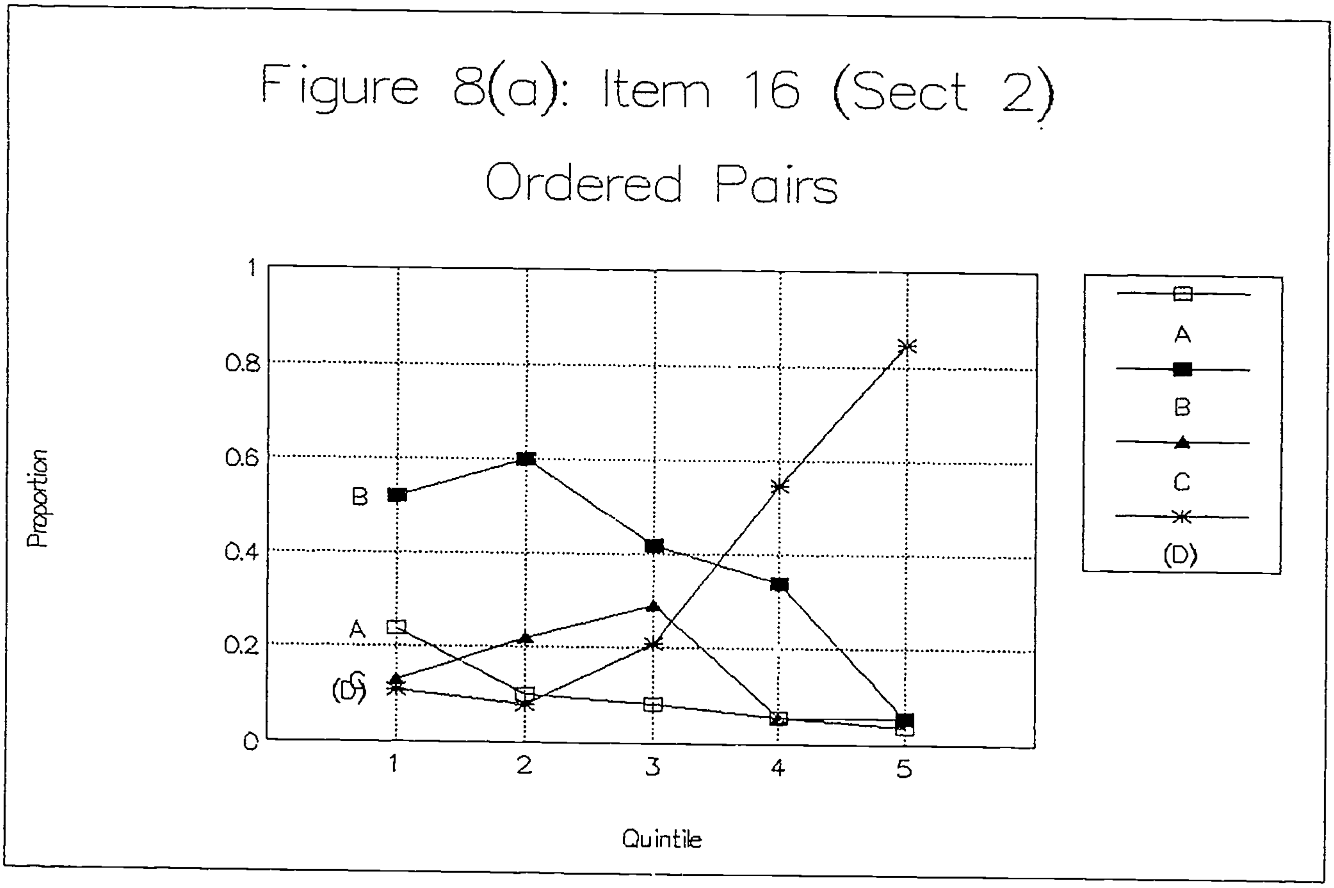


Figure 8(a): Item 16 (Sect 2)
Ordered Pairs
Proportion
Quintile
A
B
C
(D)
0
0.2
0.4
0.6
0.8
1
1
2
3
4
5

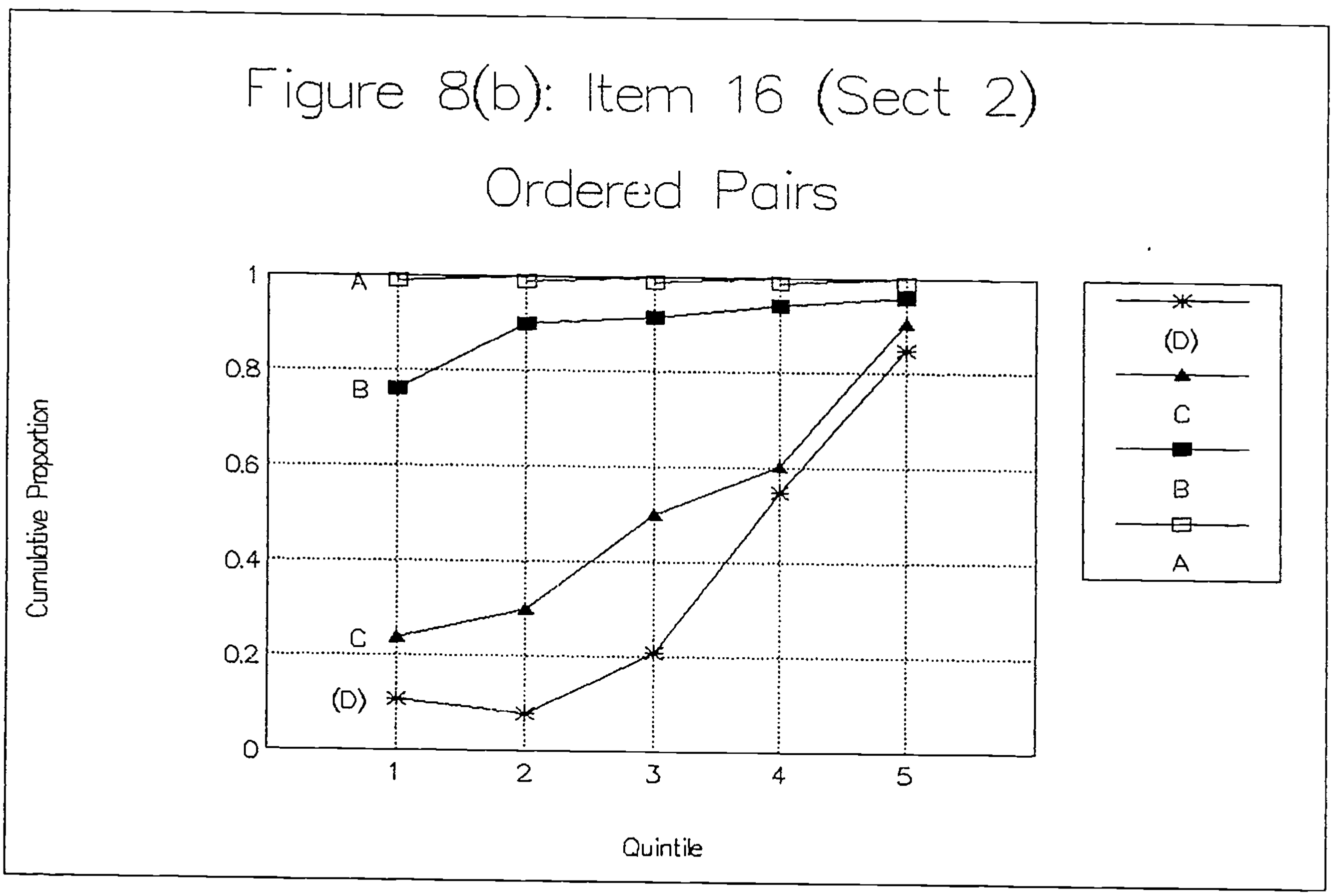


Figure 8(b): Item 16 (Sect 2)
Ordered Pairs
Cumulative Proportion
Quintile
(D)
C
B
A
0
0.2
0.4
0.6
0.8
1
1
2
3
4
5

Figure 9(a). Item 2 (Section 3)

Which number has GREATEST value?

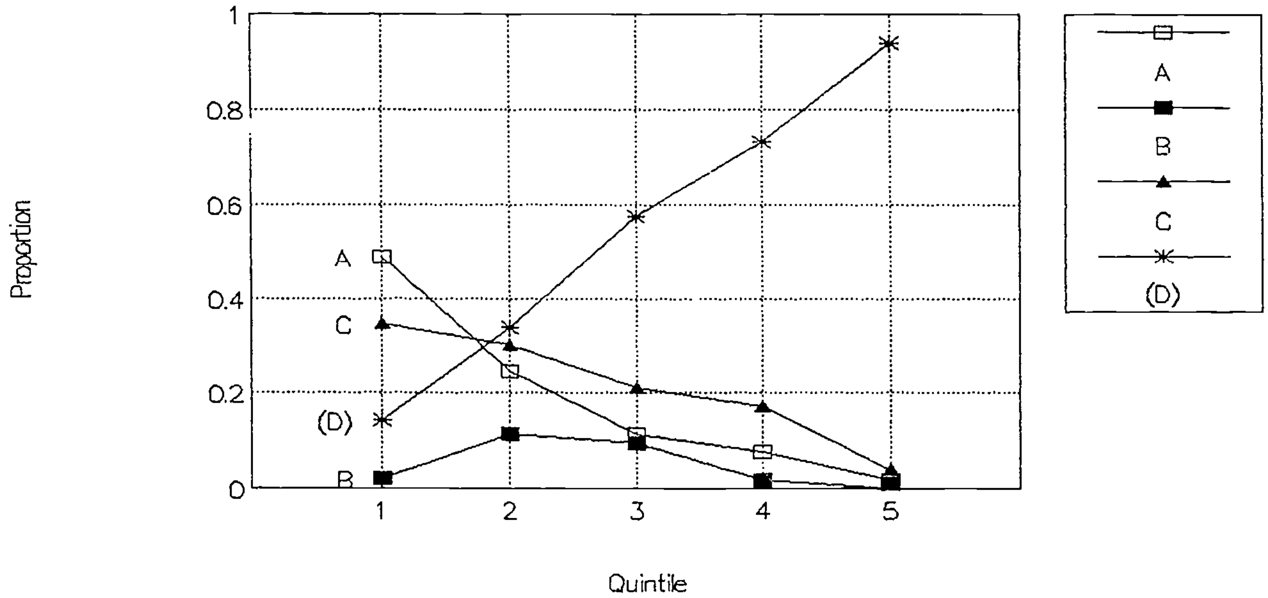
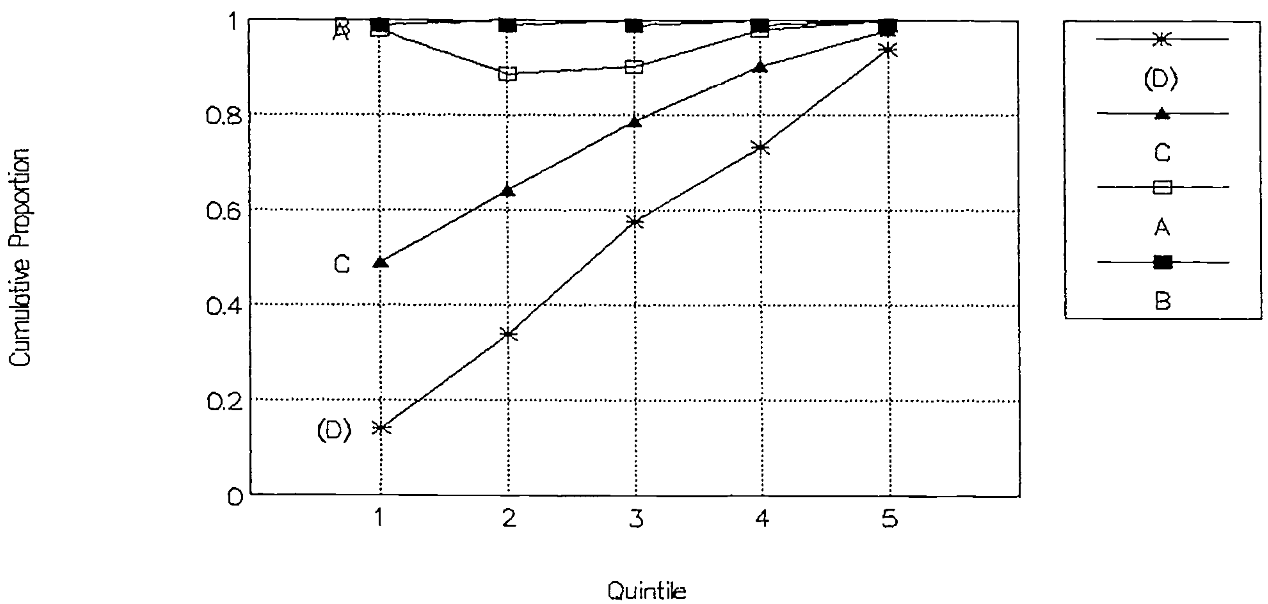



Figure 9(b). Item 2 (Section 3)

Which number has GREATEST value?



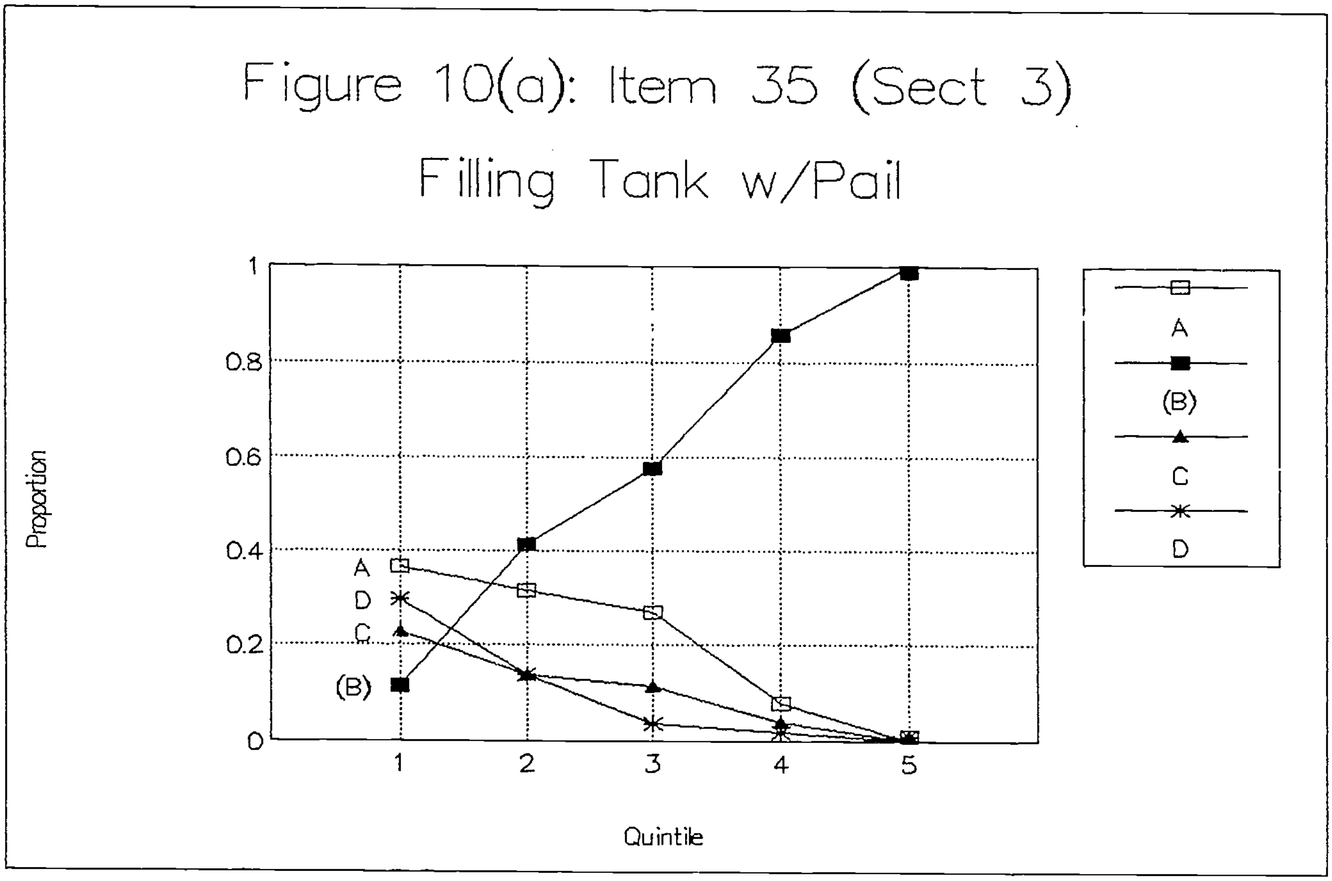


Figure 10(a): Item 35 (Sect 3)
Filling Tank w/Pail
Proportion
Quintile
A
(B)
C
D

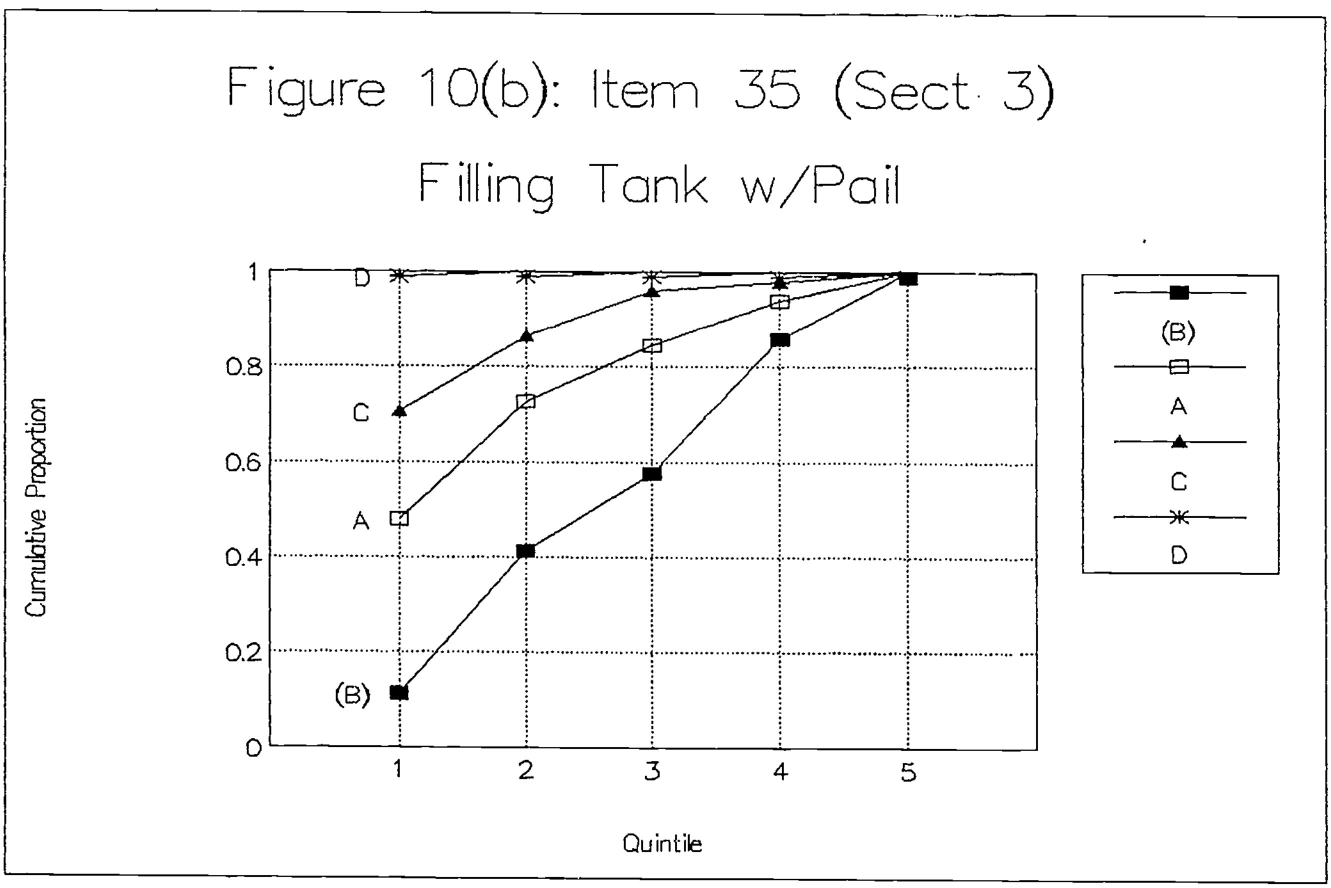


Figure 10(b): Item 35 (Sect 3)
Filling Tank w/Pail
Cumulative Proportion
Quintile
(B)
A
C
D

Figure 11(a). Item 45 (Section 3)

Hexagonal Pyramid

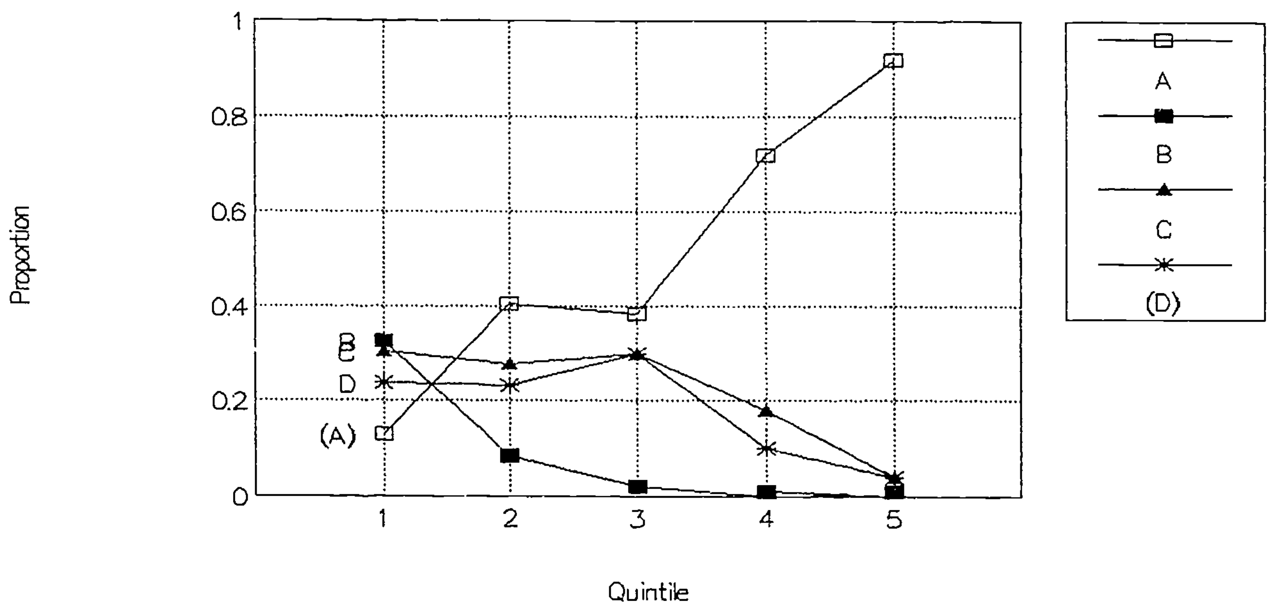



Figure 11(b). Item 45 (Section 3)

Hexagonal Pyramid

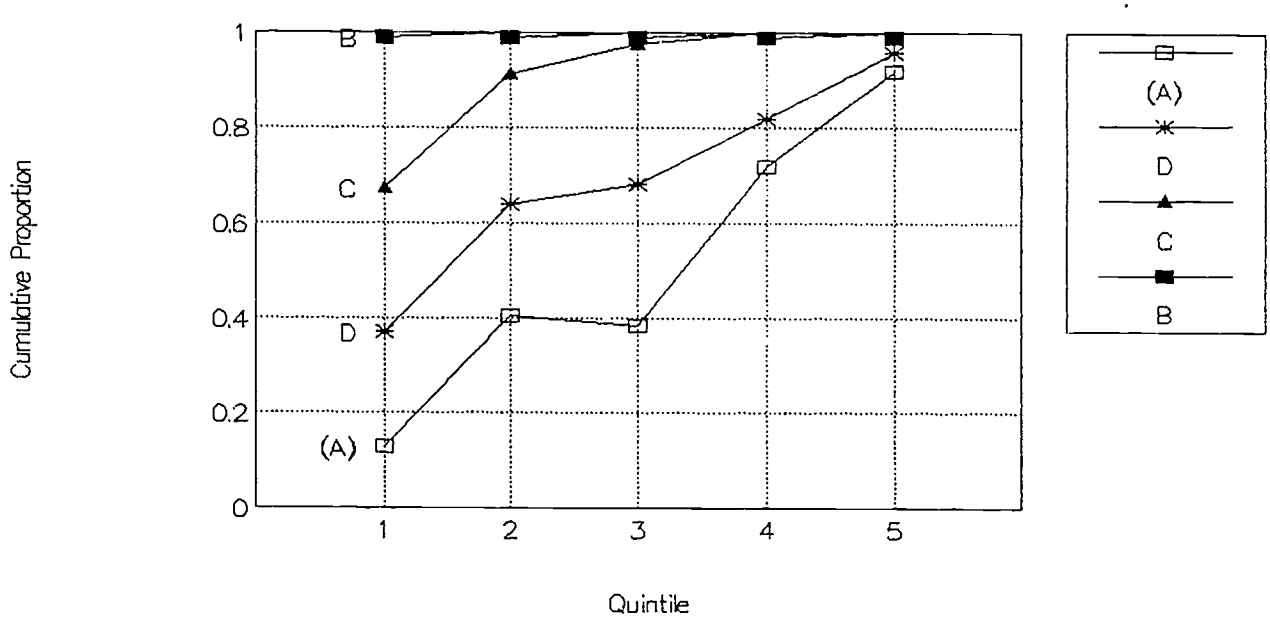


Figure 12(a). Item 56 (Section 3)

Heads on three coin tosses

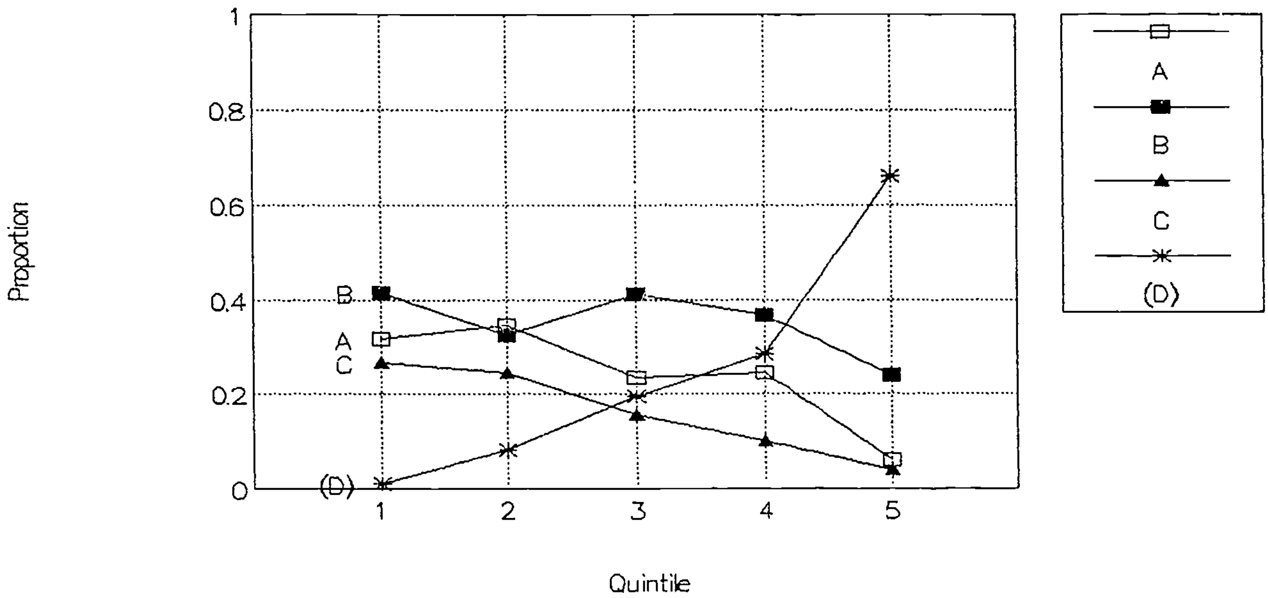



Figure 12(b). Item 56 (Section 3)

Heads on three coin tosses

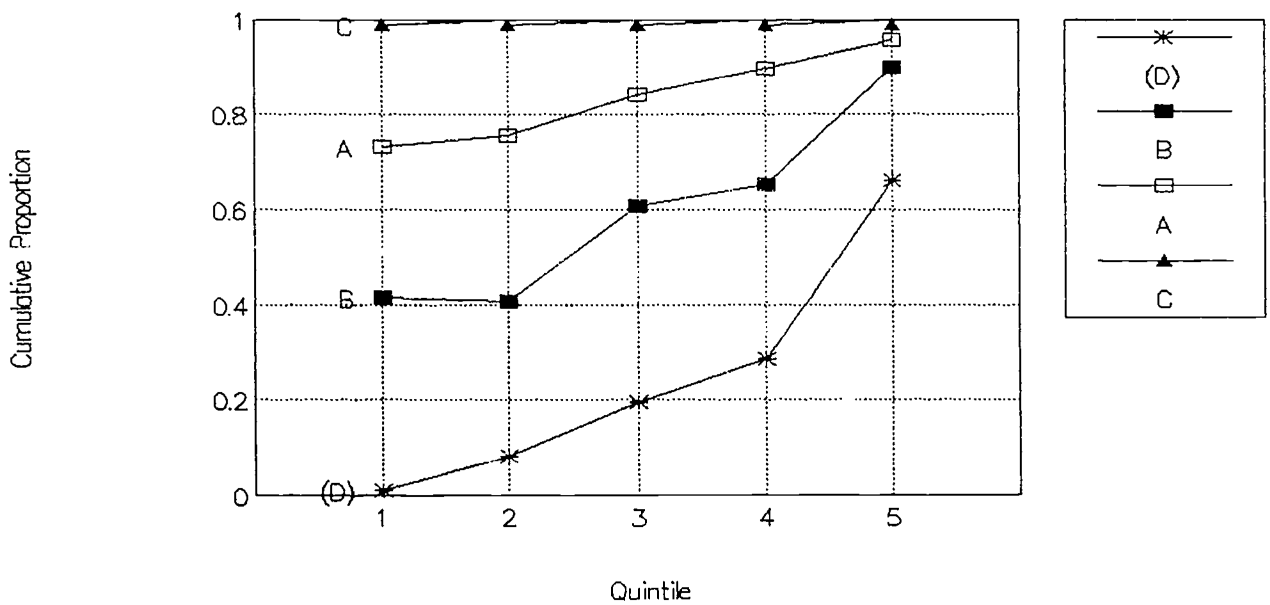


Figure 13(a): Item 62 (Sect 3)

Area Problem

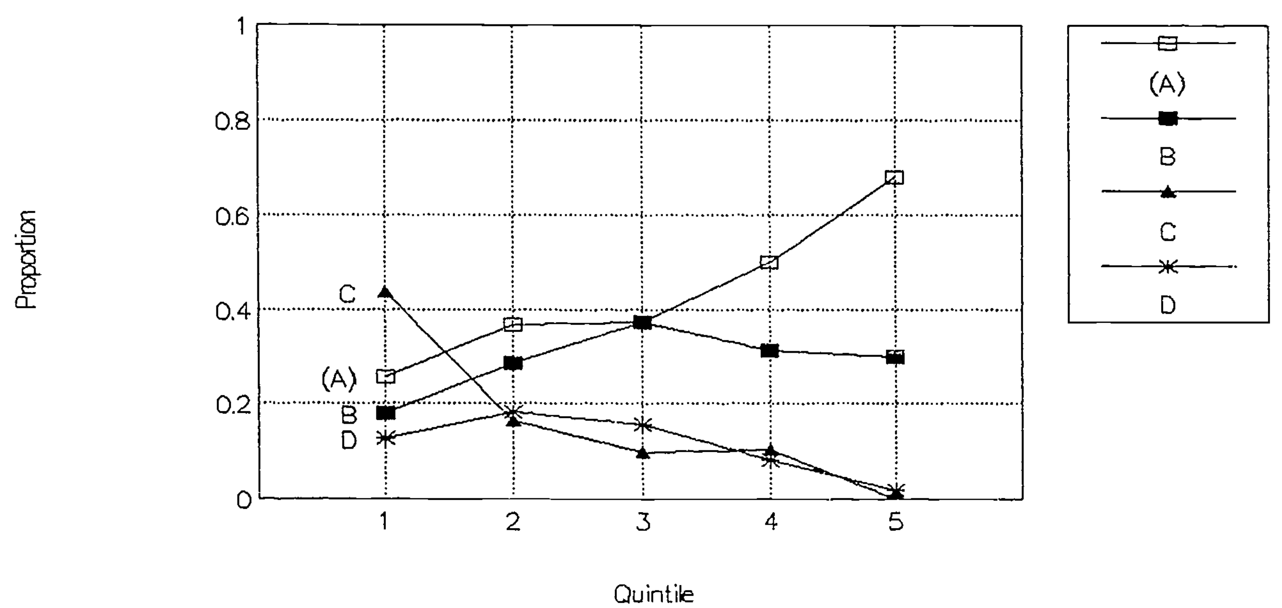



Figure 13(b): Item 62 (Sect 3)

Area Problem

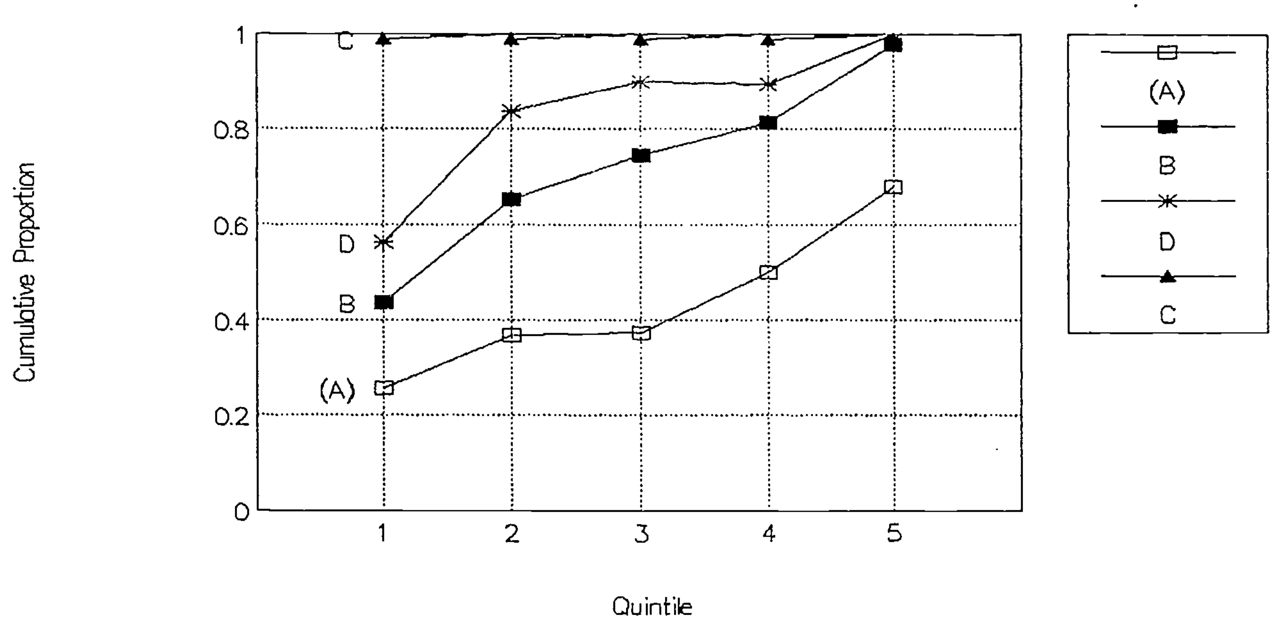


Figure 14(a): Item 69 (Sect 3)

Iron and Water in Soil

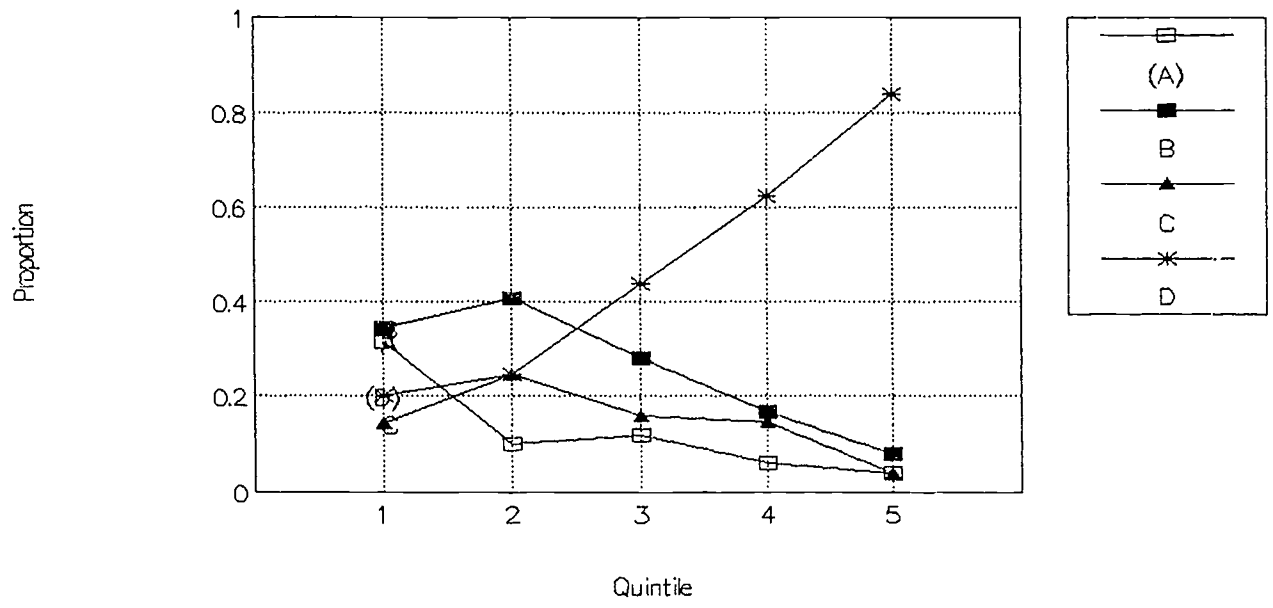
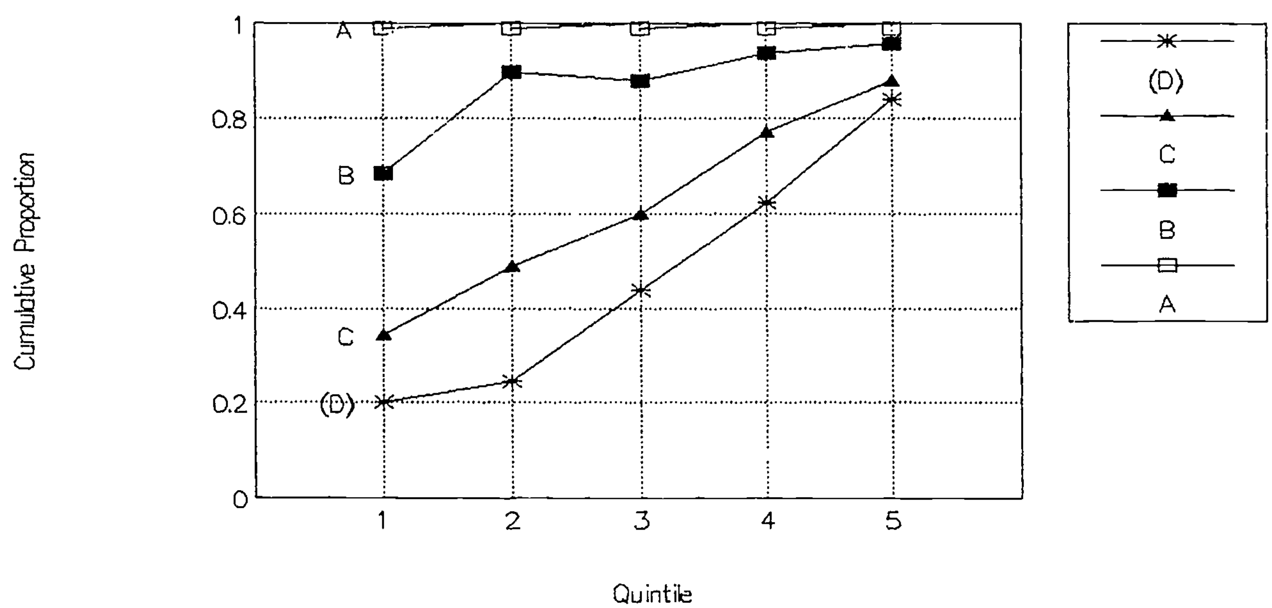



Figure 14(b): Item 69 (Sect 3)

Iron and Water in Soil



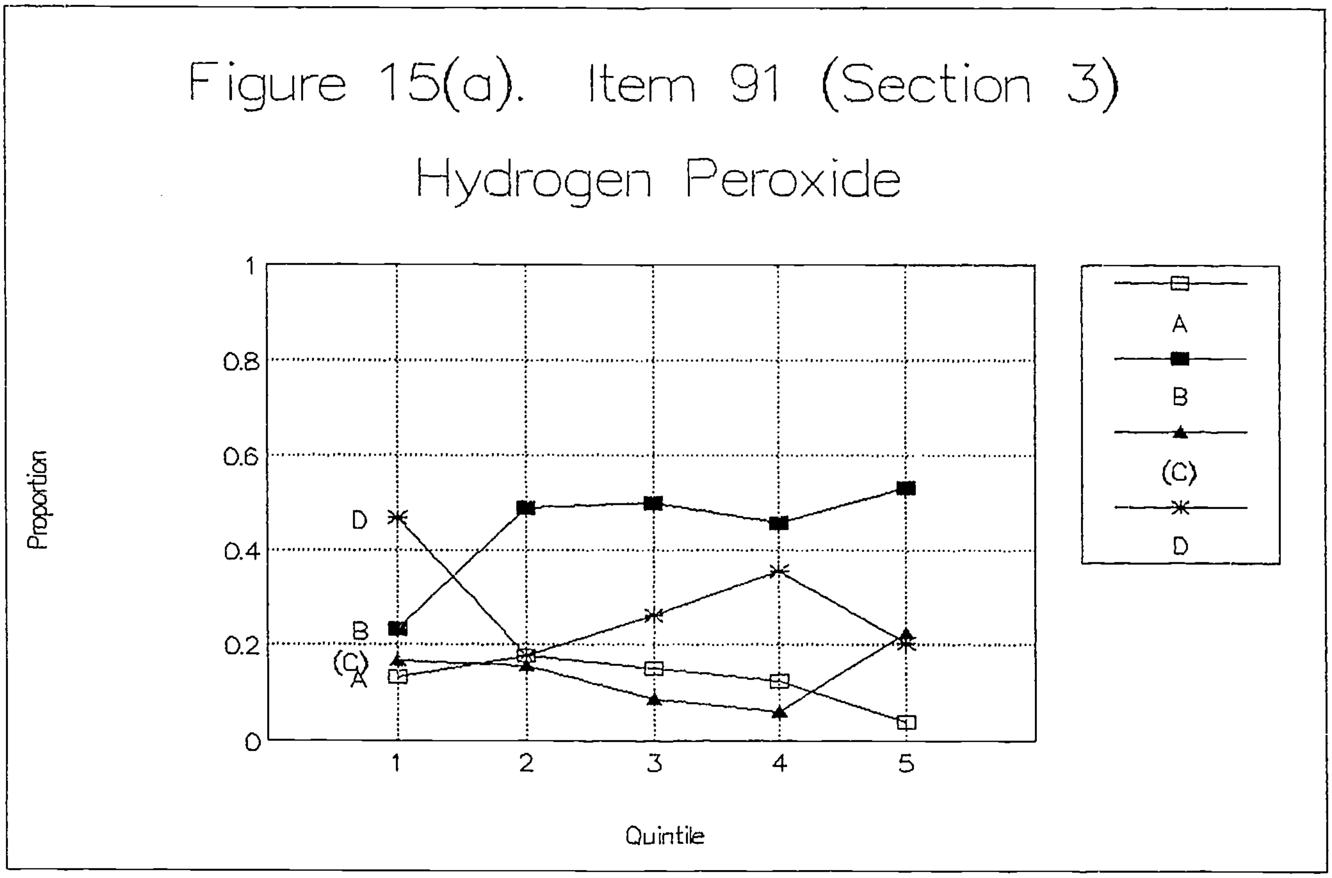


Figure 15(a). Item 91 (Section 3)
Hydrogen Peroxide
Proportion
Quintile
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
D
B
(C)
A
A
B
(C)
D

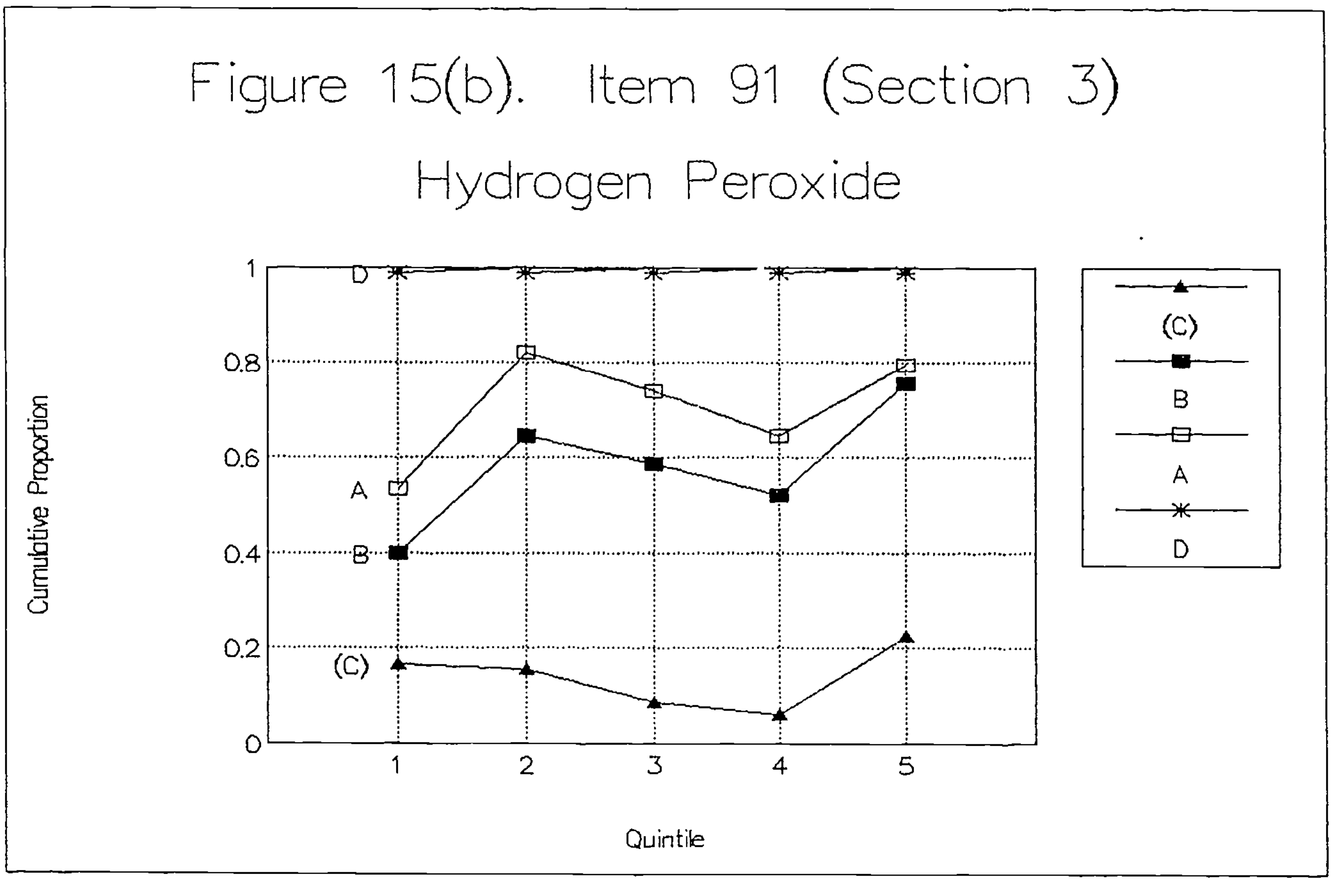



Figure 15(b). Item 91 (Section 3)
Hydrogen Peroxide
Cumulative Proportion
Quintile
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
D
A
B
(C)
(C)
B
A
D

Figure 16(a). Item 92 (Section 3)

Robot Selection

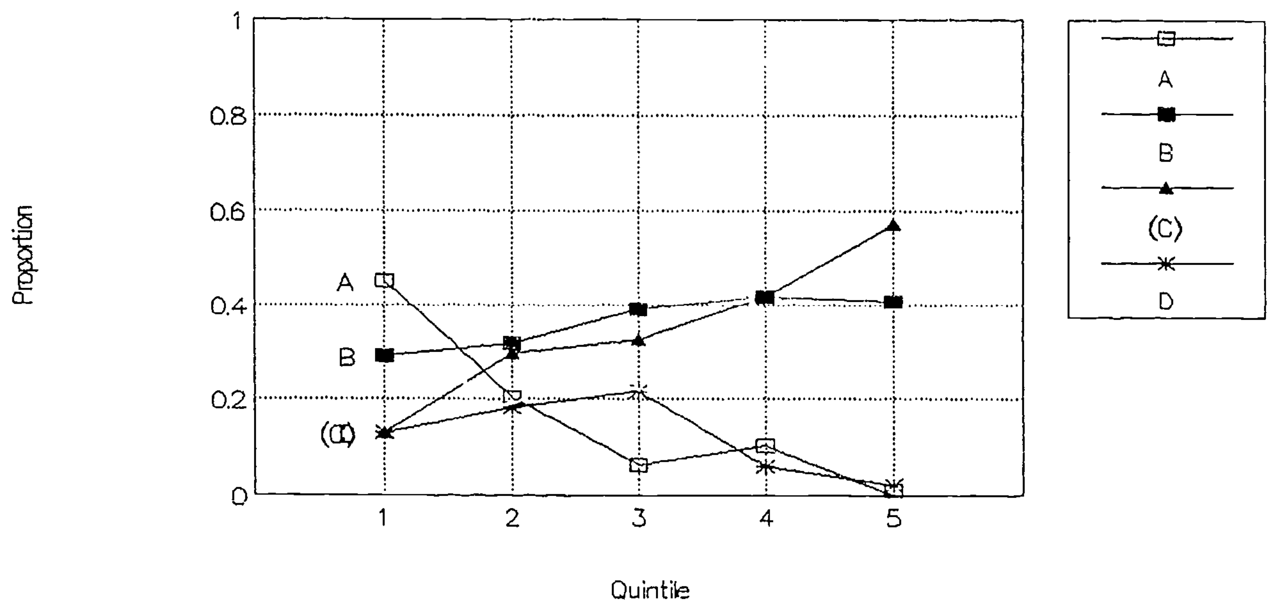



Figure 16(b). Item 92 (Section 3)

Robot Selection

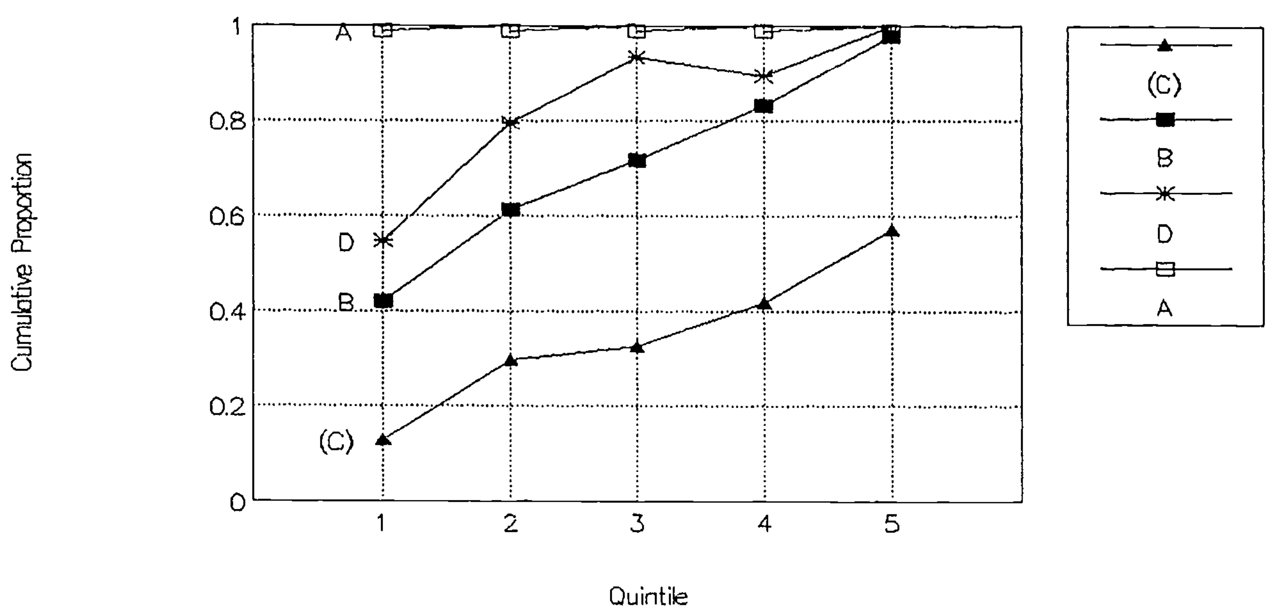


Figure 17(a): Item 93 (Sect 3)

Public Opinion Poll

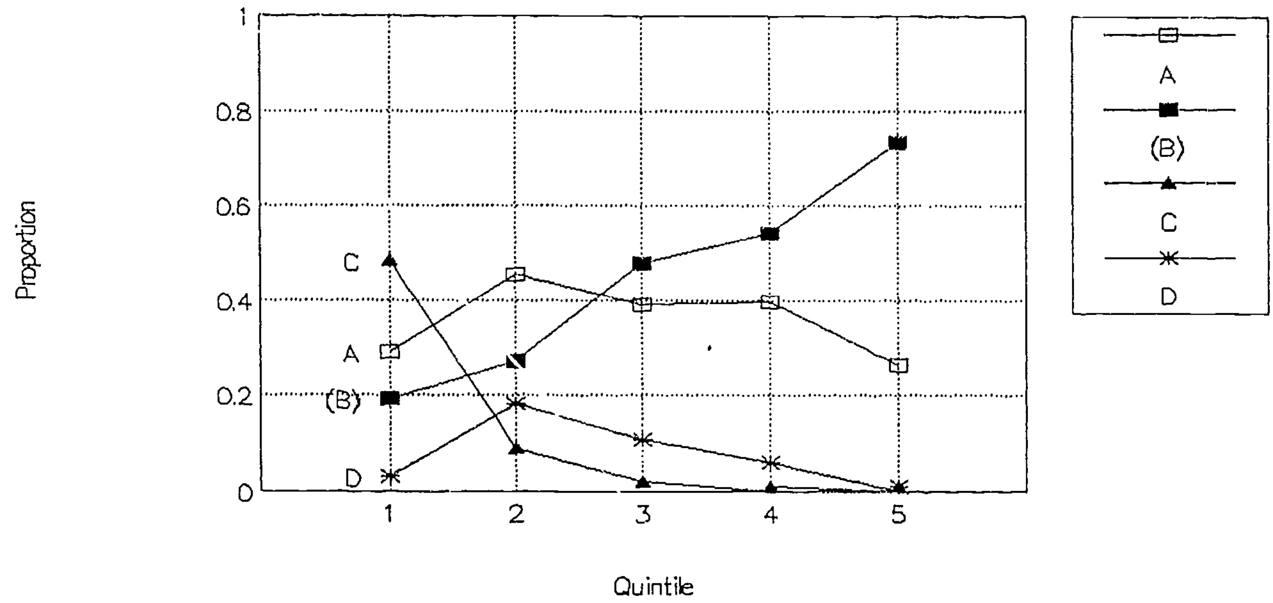
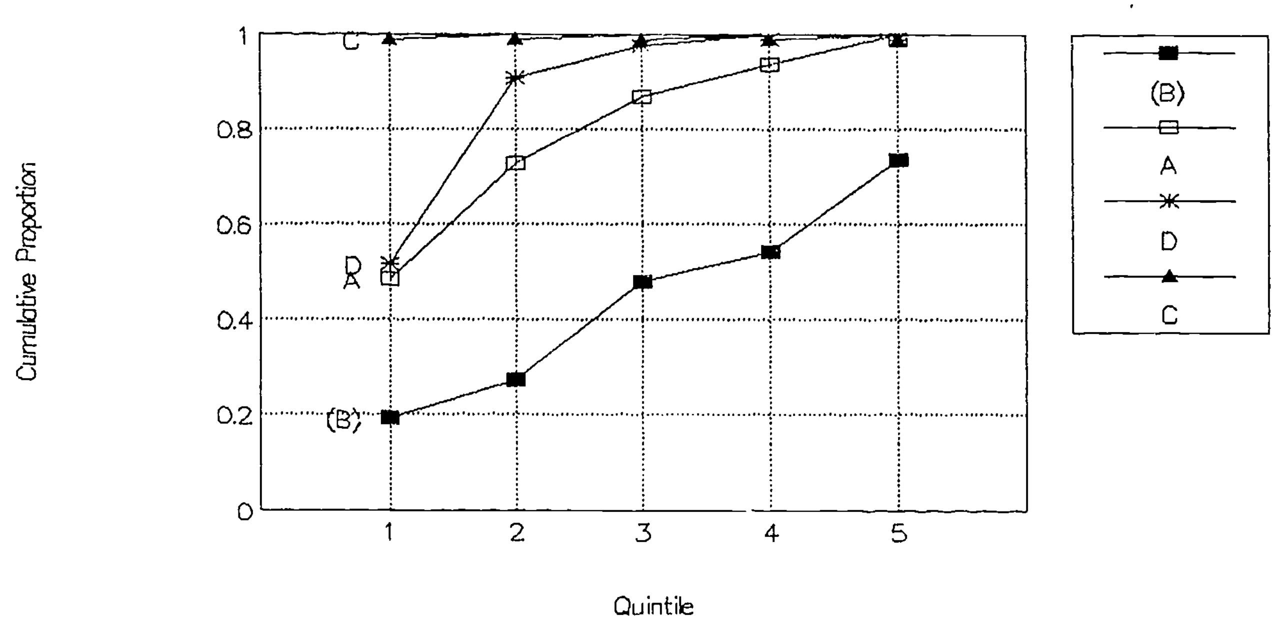



Figure 17(b): Item 93 (Sect 3)

Public Opinion Poll



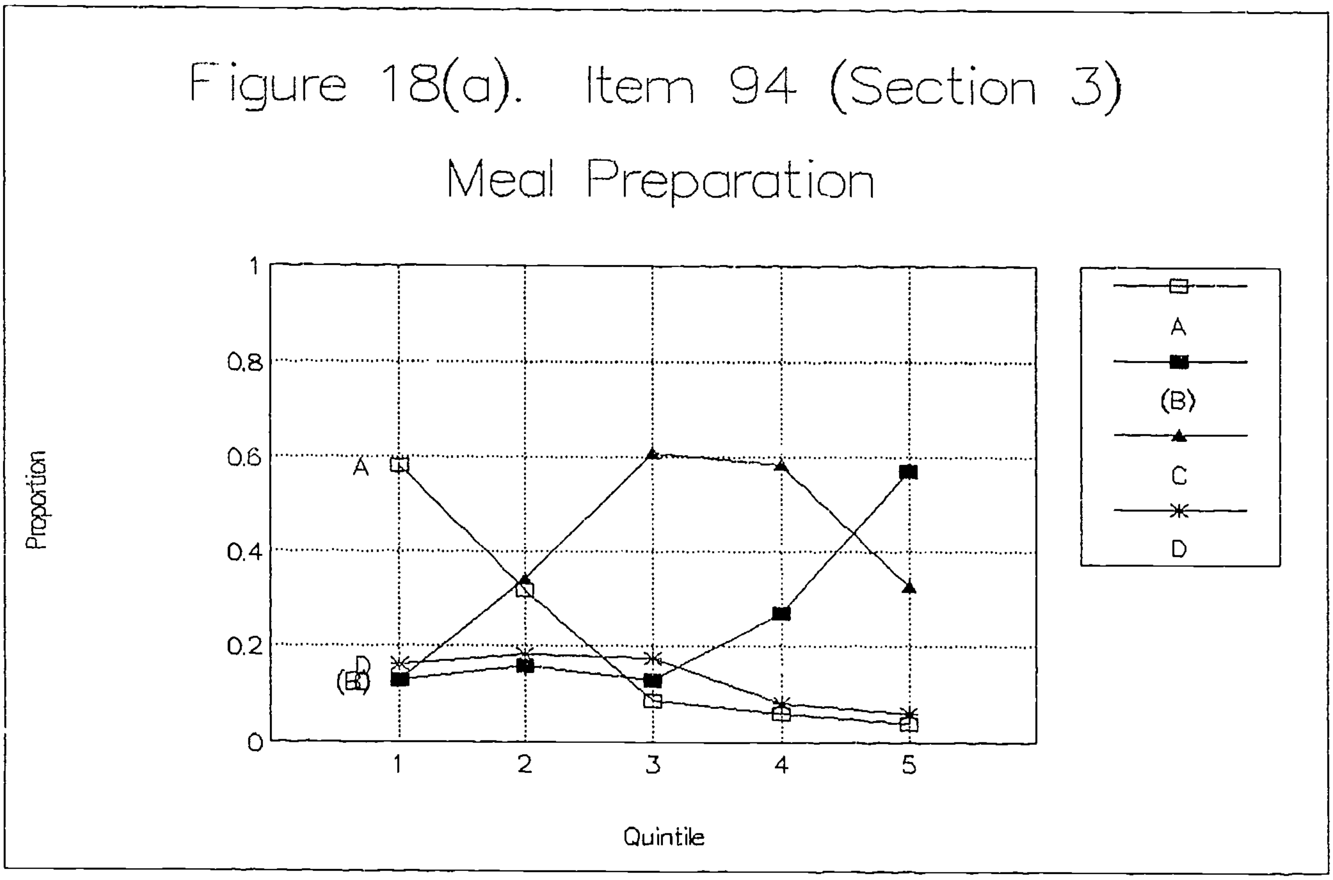


Figure 18(a). Item 94 (Section 3)
Meal Preparation
Proportion
Quintile
A
(B)
C
D
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5

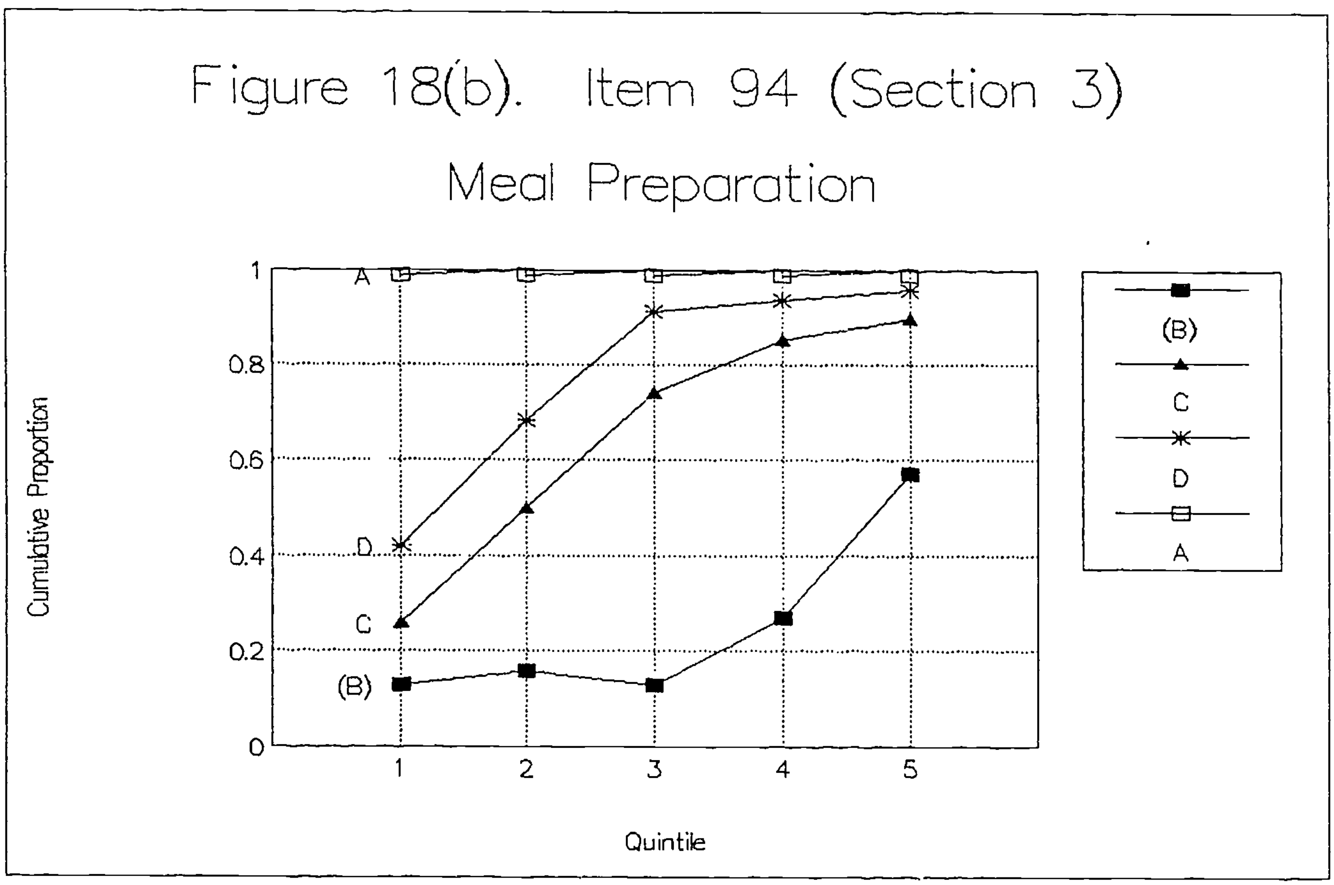


Figure 18(b). Item 94 (Section 3)
Meal Preparation
Cumulative Proportion
Quintile
(B)
C
D
A
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5

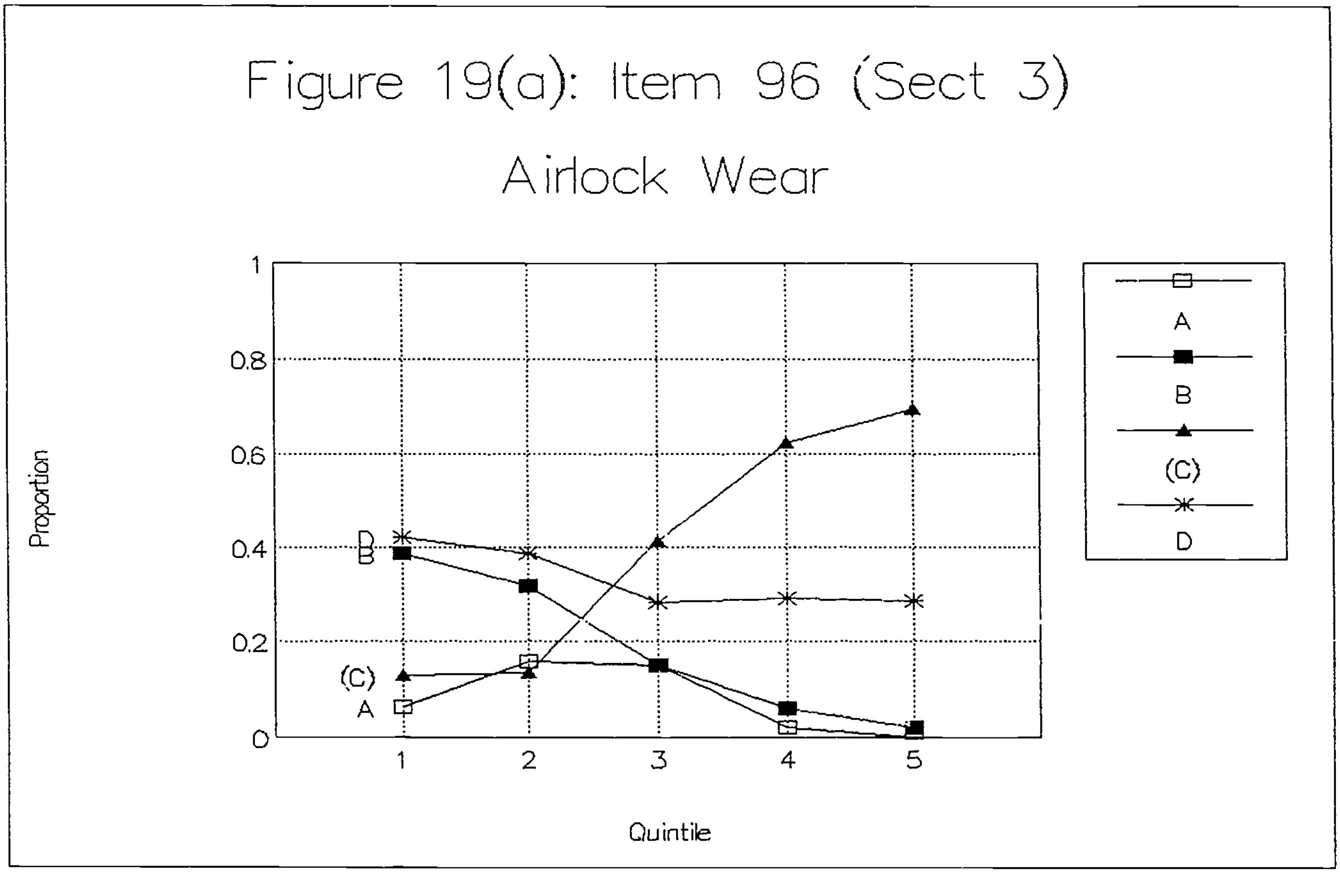


Figure 19(a): Item 96 (Sect 3)
Airlock Wear
Proportion
Quintile
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
D
B
(C)
A
(C)

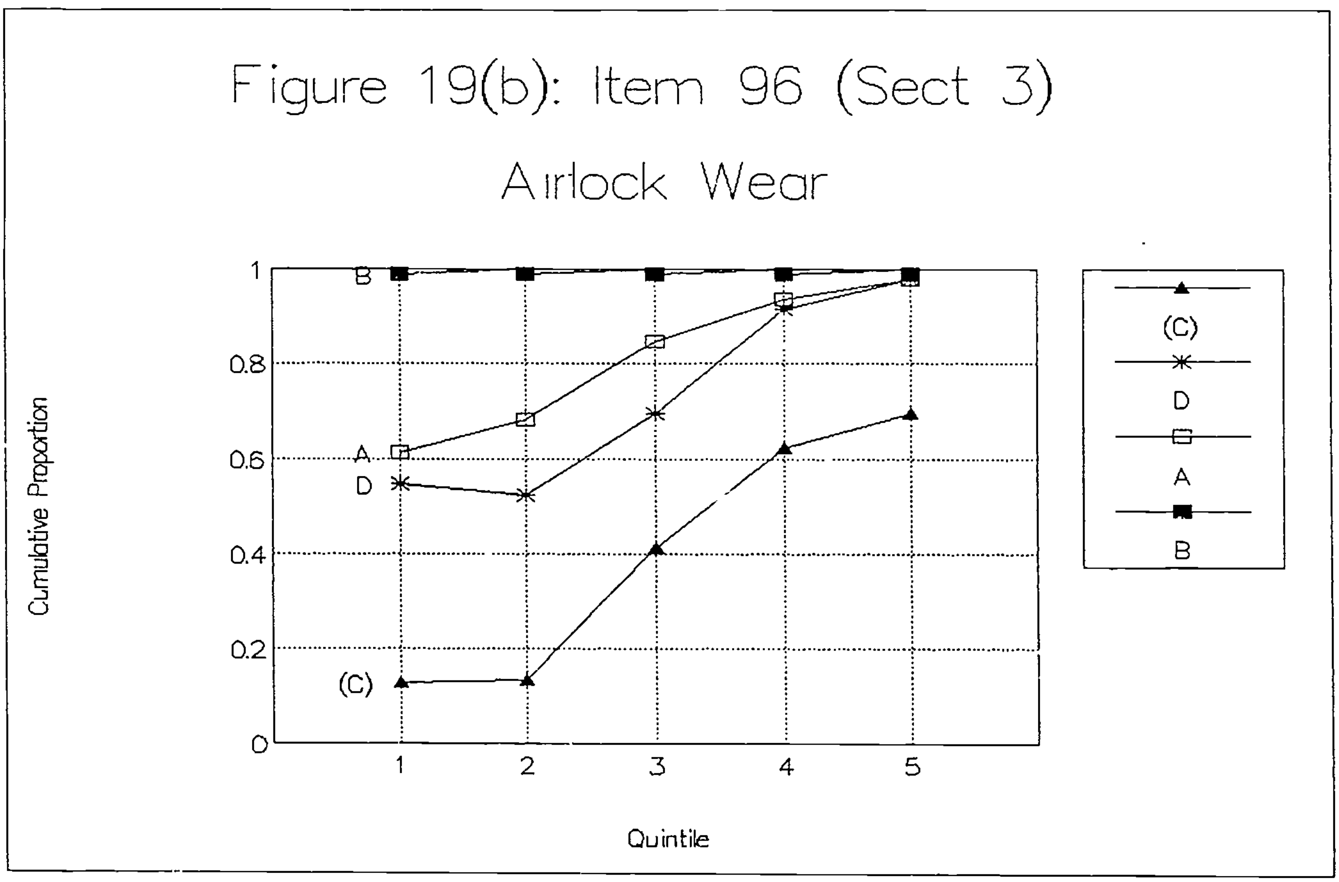



Figure 19(b): Item 96 (Sect 3)
Airlock Wear
Cumulative Proportion
Quintile
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
B
A
D
(C)
(C)
D
A
B




ERIC

DIRECTIONS: Find the BEST answer.

**17.** If r = 75 and t = 4.95, find the BEST ESTIMATE of D = rt.

**A** 400

**B** 375

**C** 300

**D** 280

**18.** $\sqrt{2501}$ is APPROXIMATELY

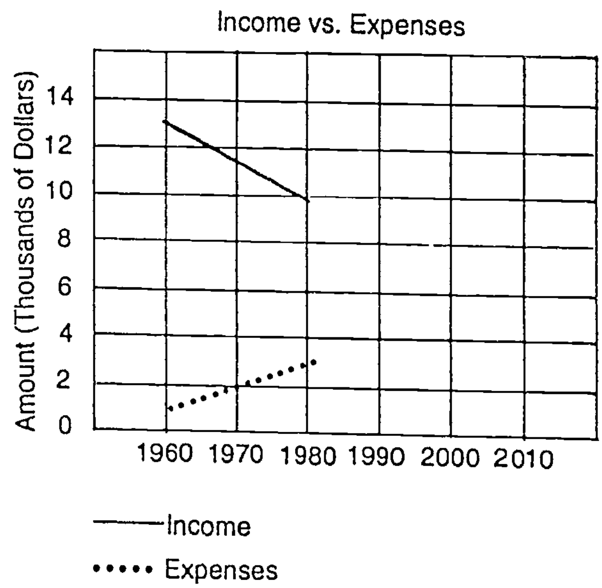
**A** 50

**B** 500

**C** 1250

**D** 2500

10. If the present trends continue, what will be the expenses in 2010?




**A** \$3,000

**B** \$4,000

**C** \$6,000

D \$9,000

**15.** −3 − 15 =

**A** 18

**B** 12

**C** −12

**D** −18

3A1

**GO ON TO THE NEXT PAGE**

DIRECTIONS: Find the BEST answer.

16. Which of these sets of ordered pairs is described by $y - x^3$?

A {(1,2), (2,4), (3,6)}

B {(1,3), (2,6), (3,9)}

C {(1,1), (2,4), (3,9)}

D {(1,1), (2,8), (3,27)}

2. Which of these numbers has the GREATEST value?

A $6.575 \times 10^{-3}$

B $1.27 \times 10^{-2}$

C $5.40 \times 10^{-4}$

D $5.01 \times 10^{-1}$

35. Tony was filling a tank with a 2.4 L pail. After putting in 6 full pails of water, the tank was one-fourth full. How much water will be in the tank when it is full?

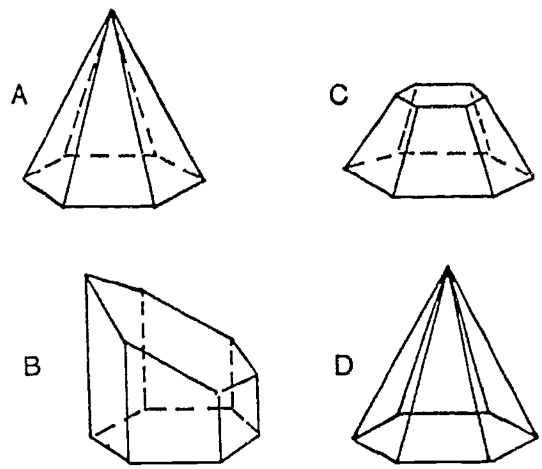
A 24 L

B 57.6 L

C 72 L

D 86.4 L

45. Which of these is an appropriate drawing of a hexagonal pyramid?




56. What is the probability of getting three heads in a row tossing a fair coin?

A $\frac{3}{2}$

B $\frac{1}{2}$

C $\frac{1}{4}$

D $\frac{1}{8}$

## Background Information

Questions 91 through 96 involve the inhabitants of a distant planet. This planet, called Romula, is located in a different galaxy. The Romulans have built the Alpha Centauri Space Station (ACSS), which is a self-sufficient space capsule. It is staffed and populated only by people from Romula and their families. Many have compared the ACSS with a floating city. Most services are provided within the space station. Try to imagine what it would be like to live and work on such a space station as you answer these questions.

91. The ACSS has a factory which decomposes hydrogen peroxide to produce water and oxygen for the station's living areas. Only oxygen and water are produced. There are no by-products or waste from this process. The ratio (by mass) of oxygen to water produced is 16 to 18. An emergency supply of 160,000 kg of oxygen is needed immediately. If each supply vehicle can carry 4,000 kg of hydrogen peroxide, how many vehicles must be brought into the decomposition plant to supply enough hydrogen peroxide to produce the needed oxygen?

A 9 vehicles

B 40 vehicles

C 85 vehicles

D need more information

92. A Romulan family needs a robot to do cleaning tasks three times per week, repair tasks twice per week, and aluminum recycling tasks once per week. It is important that all work be completed in a minimum amount of time. Which of the three available robots from the chart below should be selected?

A Robot 347

B Robot 48A

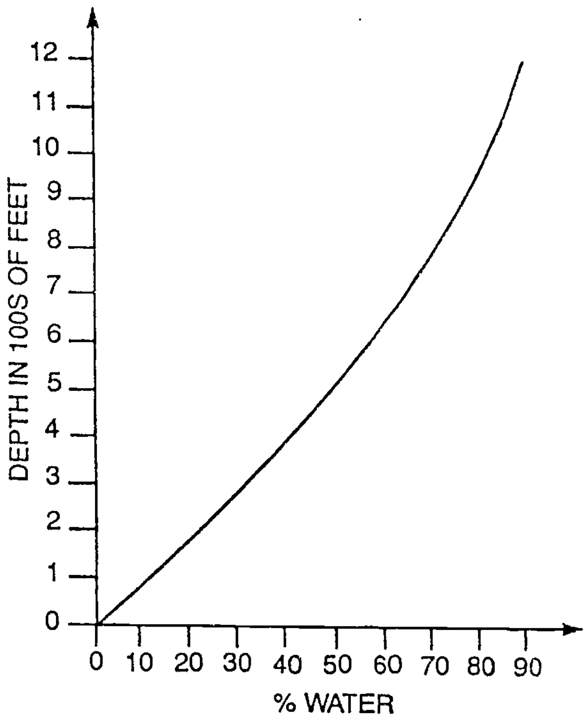
C Robot 50C

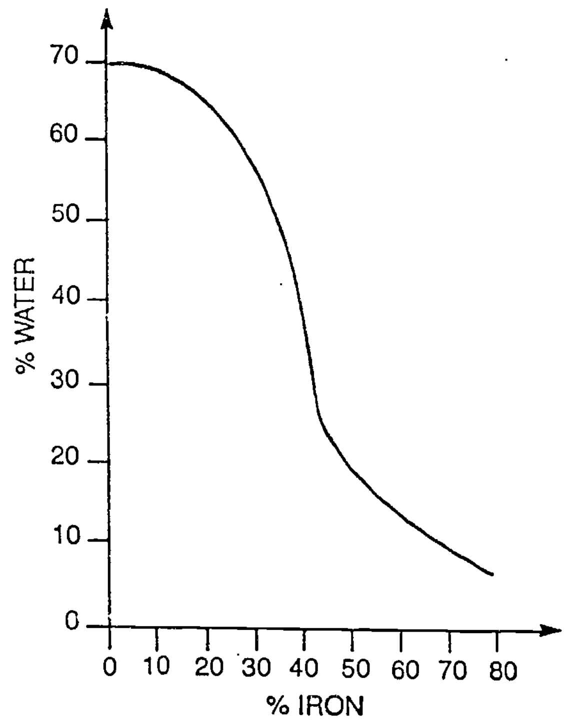
D cannot be determined

| | Average Completion Time per Task | | |
|---|---|---|---|
| Robot | Repairs | Cleaning | Recycling |
| Robot 347 | 1 hour | 2 hours | 1 hour |
| Robot 48A | 45 minutes | 1.5 hours | 30 minutes |
| Robot 50C | 0.5 hours | 1 hour | 1.5 hours |

DIRECTIONS: Find the BEST answer.

Data on iron and water composition from soil sample analyses were graphed:




69. Based on the information in the graphs, which of the following statements is true?

A The greater the depth, the less percentage of water in the sample.

B The greater the percentage of water in the sample, the greater the percentage of iron in the sample.

C The greater the depth, the greater the percentage of iron in the sample.

D The greater the depth, the less percentage of iron in the sample.

DIRECTIONS: Find the BEST answer.

93. A public opinion firm has been asked to determine what the Romulans think about the ACSS. To get the most representative sample, whom should they interview?

A Romulans living on the ACSS

B Romulans living on the ACSS and/or on the planet

C political leaders from the planet

D Romulans living on the planet

94. On the ACSS, computers are programmed to prepare the meals. The evening meal is to be served at 5:30 p.m. It consists of a casserole which takes 30 minutes to cook and must cool 10 minutes before serving; bread which is to be warmed for 35 minutes; and vegetables which must cook for 15 minutes. There is also a dessert to be served at 6:00 p.m which must cook for 60 minutes. In which order should the computer prepare the food?

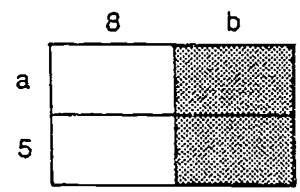
A casserole, bread, vegetables, dessert

B casserole, bread, dessert, vegetables

C dessert, casserole, bread, vegetables

D dessert, bread, casserole, vegetables

62. If the area of a rectangle is found by multiplying length by width, find the area of the shaded region below.




A ab + 5b

B 5ab

C ab + 5

D a + 5b

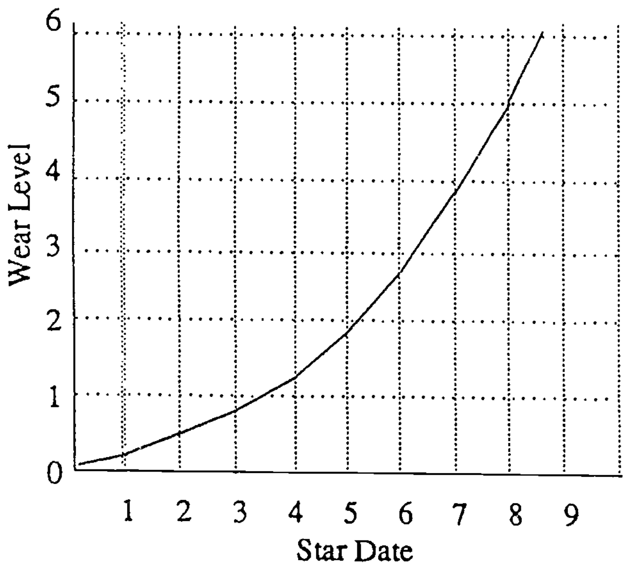


ERIC

DIRECTIONS: Find the BEST answer.

96. On the ACSS, there is an airlock which permits the people on the station to go in and out without losing air from the living/working quarters. Since the parts wear a little every time the airlock is opened and closed, it is necessary to keep track of the wear and replace the parts when they become too worn. If the wear reaches Level 5, serious problems will occur, bringing danger to the ACSS crew and their families. What is the latest stardate when corrective action should be taken, based on the chart below?

FIGURE 1. Airlock Wear Level as a Function of Time




A 2

B 3

C 7

D 8

MEAP MATH; SHORT VERSION GRADE 10 "BIGSCALE" RASCH ANALYSIS VER. 1.73 Jan 31 20:25:51 1991
INPUT: 262 PERSONS 16 ITEMS ANALYZED: 249 PERSONS 16 ITEMS 2 CATEGORIES TABLE B-1

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1111 1 11<br>3476218140653952 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 85 | | 0 | 0 | OUT | | | | | |
| 256 | 1111111010000000 | 8 | 16 | -.01 | .55 | .6 | -2.2 | .6 | -1.6 |
| 171 | 1111111000100000 | 8 | 16 | -.01 | .55 | .7 | -1.9 | .6 | -1.5 |
| 224 | 1111111010100000 | 9 | 16 | .30 | .56 | .7 | -1.8 | .6 | -1.4 |
| 245 | 11 1111110100000 | 9 | 15 | .55 | .58 | .6 | -1.8 | .6 | -1.3 |
| 251 | 1111111110100000 | 10 | 16 | .61 | .57 | .6 | -1.8 | .5 | -1.4 |
| 162 | 1111101011000000 | 8 | 16 | -.01 | .55 | .7 | -1.7 | .6 | -1.4 |
| 242 | 1111111011100000 | 10 | 16 | .61 | .57 | .7 | -1.6 | .6 | -1.3 |
| 145 | 1110111111000000 | 9 | 16 | .30 | .56 | .7 | -1.5 | .6 | -1.2 |
| 154 | 1101111100000000 | 7 | 16 | -.31 | .55 | .7 | -1.5 | .6 | -1.2 |
| 172 | 1111011100100000 | 8 | 16 | -.01 | .55 | .7 | -1.5 | .6 | -1.3 |
| 183 | 1111110110010000 | 9 | 16 | .30 | .56 | .7 | -1.5 | .6 | -1.2 |
| 208 | 1111100000000000 | 5 | 16 | -.96 | .59 | .6 | -1.5 | .5 | -1.2 |
| 223 | 1111111111010000 | 11 | 16 | .95 | .59 | .6 | -1.5 | .5 | -1.2 |
| 77 | 10 | 1 | 2 | -.74 | 1.42 | .9 | -1.4 | .9 | -.1 |
| 161 | 1111100100100000 | 7 | 16 | -.31 | .55 | .7 | -1.4 | .7 | -1.1 |
| 247 | 1111111111110000 | 12 | 16 | 1.32 | .63 | .6 | -1.4 | .4 | -1.1 |
| 32 | 1111101111010000 | 10 | 16 | .61 | .57 | .7 | -1.3 | .6 | -1.0 |
| 59 | 1111100110100000 | 8 | 16 | -.01 | .55 | .8 | -1.3 | .7 | -1.0 |
| 229 | 11111001001 0000 | 7 | 15 | -.21 | .57 | .8 | -1.3 | .7 | -1.0 |
| 33 | 1111101011010000 | 9 | 16 | .30 | .56 | .8 | -1.2 | .7 | -1.1 |
| 86 | 11 00 0 | 2 | 5 | -1.26 | 1.00 | .5 | -1.2 | .5 | -1.2 |
| 102 | 10 | 1 | 2 | -1.77 | 1.46 | .6 | -1.2 | .6 | -.8 |
| 169 | 1111000000000000 | 4 | 16 | -1.33 | .63 | .6 | -1.2 | .5 | -1.0 |
| 219 | 1111000000000000 | 4 | 16 | -1.33 | .63 | .6 | -1.2 | .5 | -.9 |
| 97 | 11 000 0 | 2 | 6 | -1.55 | .93 | .6 | -1.1 | .5 | -1.0 |
| 150 | 1111011011010000 | 9 | 16 | .30 | .56 | .8 | -1.1 | .7 | -1.0 |
| 191 | 1111101110110000 | 10 | 16 | .61 | .57 | .7 | -1.1 | .7 | -.9 |
| 234 | 1111111111111000 | 13 | 16 | 1.76 | .70 | .6 | -1.1 | .4 | -1.0 |
| 94 | 1110010100000000 | 5 | 16 | -.96 | .59 | .7 | -1.0 | .6 | -.8 |
| 144 | 1111111011011000 | 11 | 16 | .95 | .59 | .7 | -1.0 | .6 | -.8 |
| 163 | 1111100110001000 | 8 | 16 | -.01 | .55 | .8 | -1.0 | .7 | -.9 |
| 186 | 1111111101111000 | 12 | 16 | 1.32 | .63 | .7 | -1.0 | .5 | -.8 |
| 209 | 1011111001000000 | 7 | 16 | -.31 | .55 | .8 | -1.0 | .7 | -.8 |
| 239 | 1111101100101000 | 9 | 16 | .30 | .56 | .8 | -1.0 | .7 | -.9 |
| 240 | 1110101000010000 | 6 | 16 | -.62 | .57 | .8 | -1.0 | .7 | -.8 |
| 10 | 1101000 0 | 3 | 8 | -1.28 | .78 | .7 | -.9 | .7 | -.7 |
| 78 | 11100111 0 0 0 | 6 | 11 | -.19 | .65 | .8 | -.9 | .7 | -.8 |
| 122 | 1111011010110000 | 9 | 16 | .30 | .56 | .8 | -.9 | .7 | -.9 |
| 127 | 1110101001100000 | 7 | 16 | -.31 | .55 | .8 | -.9 | .7 | -.9 |
| 140 | 1110110101010000 | 8 | 16 | -.01 | .55 | .8 | -.9 | .7 | -.9 |
| 182 | 1111111101000100 | 10 | 16 | .61 | .57 | .8 | -.9 | .7 | -.9 |
| 198 | 1110000100000000 | 4 | 16 | -1.33 | .63 | .7 | -.9 | .6 | -.7 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1111 1 11<br>3476218140653952 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 233 | 1111010010001000 | 7 | 16 | -.31 | .55 | .8 | -.9 | .8 | -.7 |
| 237 | 1111010011010000 | 8 | 16 | -.01 | .55 | .8 | -.9 | .7 | -.9 |
| 80 | 1110  00 1 0 0 | 4 | 9 | -.66 | .73 | .8 | -.8 | .7 | -.8 |
| 180 | 1111101111111000 | 12 | 16 | 1.32 | .63 | .7 | -.8 | .7 | -.5 |
| 236 | 1110010011000000 | 6 | 16 | -.62 | .57 | .8 | -.8 | .7 | -.7 |
| 249 | 1110111110101000 | 10 | 16 | .61 | .57 | .8 | -.8 | .7 | -.7 |
| 13 | 10 0        0 | 1 | 4 | -2.26 | 1.25 | .5 | -.7 | .4 | -.4 |
| 43 | 1111111111110100 | 13 | 16 | 1.76 | .70 | .7 | -.7 | .5 | -.7 |
| 146 | 1111  1100100100 | 8 | 14 | .42 | .60 | .8 | -.7 | .7 | -.7 |
| 152 | 1111  11110 0010 | 9 | 13 | 1.05 | .67 | .8 | -.7 | .6 | -.7 |
| 188 | 1111101110111000 | 11 | 16 | .95 | .59 | .8 | -.7 | .7 | -.6 |
| 260 | 1110101      0 | 5 | 8 | -.13 | .77 | .8 | -.7 | .7 | -.6 |
| 37 | 1111111110110100 | 12 | 16 | 1.32 | .63 | .8 | -.6 | .6 | -.6 |
| 44 | 1111111101110100 | 12 | 16 | 1.32 | .63 | .8 | -.6 | .6 | -.6 |
| 50 | 1111111111111100 | 14 | 16 | 2.32 | .81 | .6 | -.6 | .3 | -.6 |
| 55 | 1110000000001000 | 4 | 16 | -1.33 | .63 | .8 | -.6 | .8 | -.2 |
| 69 | 1101  0000010000 | 4 | 14 | -1.06 | .65 | .8 | -.6 | .7 | -.4 |
| 90 | 11001101 0 0 0 | 5 | 11 | -.61 | .65 | .9 | -.6 | .8 | -.6 |
| 143 | 1110110000101000 | 7 | 16 | -.31 | .55 | .9 | -.6 | .8 | -.6 |
| 167 | 1111111110110010 | 12 | 16 | 1.32 | .63 | .8 | -.6 | .6 | -.6 |
| 178 | 1111111101110100 | 12 | 16 | 1.32 | .63 | .8 | -.6 | .6 | -.6 |
| 184 | 1111111101010100 | 11 | 16 | .95 | .59 | .8 | -.6 | .7 | -.7 |
| 11 | 1011000      0 | 3 | 8 | -1.28 | .78 | .8 | -.5 | .8 | -.6 |
| 30 | 1111111110111100 | 13 | 16 | 1.76 | .70 | .8 | -.5 | .6 | -.4 |
| 39 | 1111111110111100 | 13 | 16 | 1.76 | .70 | .8 | -.5 | .6 | -.4 |
| 51 | 1111111111011010 | 13 | 16 | 1.76 | .70 | .7 | -.5 | .6 | -.5 |
| 81 | 1010  0      0 0 | 2 | 7 | -1.65 | .92 | .7 | -.5 | .6 | -.4 |
| 84 | 1111         0 | 4 | 5 | .69 | 1.18 | .6 | -.5 | .4 | -.4 |
| 138 | 1101000000010000 | 4 | 16 | -1.33 | .63 | .8 | -.5 | .8 | -.2 |
| 149 | 1101101101001000 | 8 | 16 | -.01 | .55 | .9 | -.5 | .8 | -.6 |
| 179 | 1111111111011010 | 13 | 16 | 1.76 | .70 | .7 | -.5 | .6 | -.5 |
| 194 | 1111111011010010 | 11 | 16 | .95 | .59 | .8 | -.5 | .7 | -.6 |
| 197 | 1111100001011000 | 8 | 16 | -.01 | .55 | .9 | -.5 | .8 | -.6 |
| 221 | 1100000010000000 | 3 | 16 | -1.76 | .69 | .8 | -.5 | .7 | -.3 |
| 45 | 1111111010110010 | 11 | 16 | .95 | .59 | .9 | -.4 | .7 | -.5 |
| 61 | 1110101010101000 | 8 | 16 | -.01 | .55 | .9 | -.4 | .8 | -.5 |
| 72 | 1101110000000010 | 6 | 16 | -.62 | .57 | .9 | -.4 | 1.0 | .0 |
| 91 | 1100  00 1 0 0 | 3 | 9 | -1.22 | .77 | .8 | -.4 | .8 | -.3 |
| 148 | 11  11       0 | 4 | 5 | .82 | 1.17 | .6 | -.4 | .4 | -.3 |
| 158 | 1110111111100010 | 11 | 16 | .95 | .59 | .9 | -.4 | .8 | -.3 |
| 168 | 1100010110000000 | 5 | 16 | -.96 | .59 | .9 | -.4 | .8 | -.5 |
| 170 | 1111111110011100 | 12 | 16 | 1.32 | .63 | .8 | -.4 | .7 | -.5 |
| 205 | 1110010101001000 | 7 | 16 | -.31 | .55 | .9 | -.4 | .8 | -.5 |
| 212 | 1011100000100000 | 5 | 16 | -.96 | .59 | .9 | -.4 | .8 | -.4 |
| 225 | 1111111100101100 | 11 | 16 | .95 | .59 | .9 | -.4 | .7 | -.5 |



ERIC Full Text Provided by ERIC

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1111 1 11<br>3476218140653952 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 226 | 1111111011111100 | 13 | 16 | 1.76 | .70 | .8 | -.4 | .7 | -.2 |
| 241 | 1111100100111000 | 9 | 16 | .30 | .56 | .9 | -.4 | .8 | -.6 |
| 243 | 0111111110110000 | 10 | 16 | .61 | .57 | .9 | -.4 | 1.6 | 1.6 |
| 255 | 1111110110010100 | 10 | 16 | .61 | .57 | .9 | -.4 | .8 | -.5 |
| 4 | 10000000 0 0 0 | 1 | 11 | -3.02 | 1.09 | .6 | -.3 | .3 | -.4 |
| 53 | 1111101111001010 | 11 | 16 | .95 | .59 | .9 | -.3 | .8 | -.4 |
| 95 | 10001000 0 0 0 0 | 2 | 12 | -2.14 | .83 | .8 | -.3 | .6 | -.1 |
| 120 | 1001 00 0 0 | 2 | 8 | -1.81 | .88 | .8 | -.3 | .7 | -.2 |
| 123 | 1101100000000010 | 5 | 16 | -.96 | .59 | .9 | -.3 | 1.1 | .3 |
| 125 | 1110111110100010 | 10 | 16 | .61 | .57 | .9 | -.3 | .8 | -.4 |
| 139 | 1100111111001000 | 9 | 16 | .30 | .56 | .9 | -.3 | .9 | -.3 |
| 147 | 10 01010 0000 | 3 | 11 | -.79 | .71 | .9 | -.3 | .7 | -.3 |
| 165 | 1111110110110100 | 11 | 16 | .95 | .59 | .9 | -.3 | .8 | -.4 |
| 181 | 1111011100010100 | 9 | 16 | .30 | .56 | .9 | -.3 | .8 | -.4 |
| 257 | 1111111100111100 | 12 | 16 | 1.32 | .63 | .9 | -.3 | .7 | -.4 |
| 2 | 1000001000000000 | 2 | 16 | -2.31 | .80 | .8 | -.2 | .6 | -.1 |
| 17 | 1010010010000000 | 4 | 16 | -1.33 | .63 | .9 | -.2 | .8 | -.3 |
| 34 | 11111111 1 1 0 | 10 | 11 | 2.17 | 1.08 | .7 | -.2 | .3 | -.4 |
| 52 | 1111111111111110 | 15 | 16 | 3.18 | 1.08 | .6 | -.2 | .2 | -.3 |
| 93 | 11 1 0 1 0 | 4 | 6 | .42 | .97 | .8 | -.2 | .7 | -.2 |
| 124 | 1110001110110000 | 8 | 16 | -.01 | .55 | .9 | -.2 | .8 | -.4 |
| 128 | 1101101101011000 | 9 | 16 | .30 | .56 | .9 | -.2 | .9 | -.3 |
| 173 | 1011101111111000 | 11 | 16 | .95 | .59 | .9 | -.2 | 1.2 | .5 |
| 232 | 1111111111111110 | 15 | 16 | 3.18 | 1.08 | .6 | -.2 | .2 | -.3 |
| 31 | 1111111011111110 | 14 | 16 | 2.32 | .81 | .9 | -.1 | .9 | .2 |
| 49 | 1111111110111110 | 14 | 16 | 2.32 | .81 | .8 | -.1 | .7 | .0 |
| 54 | 1111110101111100 | 12 | 16 | 1.32 | .63 | .9 | -.1 | .8 | -.1 |
| 64 | 1100010100001000 | 5 | 16 | -.96 | .59 | .9 | -.1 | .9 | -.1 |
| 82 | 1010 1 0 0 | 3 | 7 | -.93 | .84 | .9 | -.1 | .8 | -.3 |
| 89 | 01 10 0 0 | 2 | 6 | -.87 | .90 | .9 | -.1 | .8 | -.2 |
| 132 | 1001000001000000 | 3 | 16 | -1.76 | .69 | .9 | -.1 | .8 | -.1 |
| 156 | 1001010100000000 | 4 | 16 | -1.33 | .63 | .9 | -.1 | .7 | -.3 |
| 192 | 1111111110111110 | 14 | 16 | 2.32 | .81 | .8 | -.1 | .7 | .0 |
| 213 | 1000100001000000 | 3 | 16 | -1.76 | .69 | .9 | -.1 | .8 | .0 |
| 261 | 1011010100001000 | 6 | 16 | -.62 | .57 | 1.0 | -.1 | .9 | -.2 |
| 29 | 1111111011110110 | 13 | 16 | 1.76 | .70 | .9 | .0 | .8 | -.1 |
| 62 | 1100000000101000 | 4 | 16 | -1.33 | .63 | 1.0 | .0 | 1.1 | .3 |
| 107 | 1000001001000000 | 3 | 16 | -1.76 | .69 | 1.0 | .0 | .9 | .1 |
| 130 | 1100 0100000100 | 4 | 14 | -1.06 | .65 | 1.0 | .0 | 1.2 | .6 |
| 135 | 1010010011000000 | 5 | 16 | -.96 | .59 | 1.0 | .0 | .8 | -.2 |
| 151 | 1111111101010110 | 12 | 16 | 1.32 | .63 | 1.0 | .0 | .8 | -.3 |
| 153 | 1111011001001010 | 9 | 16 | .30 | .56 | 1.0 | .0 | .9 | -.2 |
| 203 | 1100001001001000 | 5 | 16 | -.96 | .59 | 1.0 | .0 | .9 | .0 |
| 217 | 1001111100001000 | 7 | 16 | -.31 | .55 | 1.0 | .0 | .9 | -.2 |
| 238 | 1111111011100110 | 12 | 16 | 1.32 | .63 | 1.0 | .0 | .8 | -.2 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1111 1 11<br>3476218140653952 | COUNT | TEST | MEASURE | ERROR | MNSQ INFIT | | MNSQ OUTFIT | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 10000001010 0000 | 3 | 15 | -1.71 | .70 | 1.0 | .1 | 1.0 | .2 |
| 27 | 1000000000000001 | 2 | 16 | -2.31 | .80 | .9 | .1 | 6.6 | 3.0 |
| 76 | 1001000000000010 | 3 | 16 | -1.76 | .69 | 1.0 | .1 | 1.7 | 1.0 |
| 106 | 1000110110000000 | 5 | 16 | -.96 | .59 | 1.0 | .1 | .8 | -.2 |
| 113 | 01 0 0 0 | 1 | 5 | -1.63 | 1.15 | .9 | .1 | .7 | .0 |
| 136 | 0111001000000000 | 4 | 16 | -1.33 | .63 | 1.0 | .1 | .8 | -.3 |
| 155 | 1110110001010100 | 8 | 16 | -.01 | .55 | 1.0 | .1 | .9 | -.1 |
| 164 | 1001000101000000 | 4 | 16 | -1.33 | .63 | 1.0 | .1 | .9 | -.1 |
| 207 | 1111101111000110 | 11 | 16 | .95 | .59 | 1.0 | .1 | .9 | -.2 |
| 248 | 1101100000100100 | 6 | 16 | -.62 | .57 | 1.0 | .1 | 1.1 | .3 |
| 250 | 0111110000010000 | 6 | 16 | -.62 | .57 | 1.0 | .1 | 1.0 | .2 |
| 252 | 1100101101110000 | 8 | 16 | -.01 | .55 | 1.0 | .1 | .9 | -.3 |
| 254 | 1010011010100000 | 6 | 16 | -.62 | .57 | 1.0 | .1 | .9 | -.2 |
| 25 | 1010011000000100 | 5 | 16 | -.96 | .59 | 1.0 | .2 | 1.2 | .5 |
| 46 | 1111111010110110 | 12 | 16 | 1.32 | .63 | 1.0 | .2 | .9 | -.1 |
| 56 | 0110010000000000 | 3 | 16 | -1.76 | .69 | 1.0 | .2 | .7 | -.2 |
| 71 | 1000001000000010 | 3 | 16 | -1.76 | .69 | 1.0 | .2 | 1.7 | 1.1 |
| 73 | 1010011001010000 | 6 | 16 | -.62 | .57 | 1.0 | .2 | .9 | -.1 |
| 96 | 01 0 | 1 | 3 | -1.30 | 1.23 | 1.0 | .2 | 1.0 | .1 |
| 126 | 1011001000101000 | 6 | 16 | -.62 | .57 | 1.0 | .2 | .9 | .0 |
| 157 | 1011100001000100 | 6 | 16 | -.62 | .57 | 1.0 | .2 | 1.1 | .3 |
| 174 | 01111010 0 0 0 | 5 | 11 | -.61 | .65 | 1.0 | .2 | 1.1 | .5 |
| 193 | 1111110101111110 | 13 | 16 | 1.76 | .70 | 1.0 | .2 | 1.1 | .3 |
| 206 | 1110110000110100 | 8 | 16 | -.01 | .55 | 1.0 | .2 | 1.0 | .0 |
| 235 | 1101110111111010 | 12 | 16 | 1.32 | .63 | 1.0 | .2 | 1.2 | .5 |
| 16 | 0100000000000000 | 1 | 16 | -3.15 | 1.08 | 1.0 | .3 | .5 | .1 |
| 28 | 1111111001011110 | 12 | 16 | 1.32 | .63 | 1.1 | .3 | .9 | .1 |
| 38 | 1111111111110101 | 14 | 16 | 2.32 | .81 | 1.1 | .3 | .7 | -.1 |
| 42 | 1111 00110111010 | 10 | 15 | .88 | .60 | 1.1 | .3 | 1.0 | .1 |
| 47 | 1111111111111011 | 15 | 16 | 3.18 | 1.08 | 1.0 | .3 | .5 | .1 |
| 63 | 1000010100100000 | 4 | 16 | -1.33 | .63 | 1.1 | .3 | 1.0 | .1 |
| 75 | 1011010001000010 | 6 | 16 | -.62 | .57 | 1.1 | .3 | 1.1 | .4 |
| 121 | 1101011110110100 | 10 | 16 | .61 | .57 | 1.1 | .3 | 1.0 | .2 |
| 210 | 1110101000110100 | 8 | 16 | -.01 | .55 | 1.0 | .3 | 1.0 | .0 |
| 222 | 1111110110010110 | 11 | 16 | .95 | .59 | 1.1 | .3 | .9 | -.1 |
| 6 | 0010000000000000 | 1 | 16 | -3.15 | 1.08 | 1.1 | .4 | .7 | .3 |
| 41 | 1110101110111010 | 11 | 16 | .95 | .59 | 1.1 | .4 | 1.0 | .2 |
| 57 | 1101000111101000 | 8 | 16 | -.01 | .55 | 1.1 | .4 | 1.0 | .0 |
| 66 | 1010000001000001 | 4 | 16 | -1.33 | .63 | 1.1 | .4 | 3.0 | 2.5 |
| 70 | 0101101001000000 | 5 | 16 | -.96 | .59 | 1.1 | .4 | 1.0 | .1 |
| 159 | 1111010001101010 | 9 | 16 | .30 | .56 | 1.1 | .4 | 1.0 | .0 |
| 187 | 1110111110110001 | 11 | 16 | .95 | .59 | 1.1 | .4 | 1.1 | .3 |
| 202 | 1111101101101001 | 11 | 16 | .95 | .59 | 1.1 | .4 | 1.0 | .2 |
| 15 | 0000000001000000 | 1 | 16 | -3.15 | 1.08 | 1.2 | .5 | 1.7 | .9 |
| 19 | 1000001010001000 | 4 | 16 | -1.33 | .63 | 1.1 | .5 | 1.1 | .4 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1111 1 11<br>3476218140653952 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 22 | 0000000001000000 | 1 | 16 | -3.15 | 1.08 | 1.2 | .5 | 1.7 | .9 |
| 60 | 1001010100000010 | 5 | 16 | -.96 | .59 | 1.1 | .5 | 1.2 | .7 |
| 83 | 01000100 0 0 0 | 2 | 11 | -2.13 | .83 | 1.2 | .5 | 1.0 | .2 |
| 87 | 01 00 0 | 1 | 5 | -2.42 | 1.20 | 1.2 | .5 | .9 | .2 |
| 112 | 0000100 0 0 0 | 1 | 10 | -2.95 | 1.10 | 1.2 | .5 | 1.3 | .6 |
| 211 | 1001000011100000 | 5 | 16 | -.96 | .59 | 1.1 | .5 | 1.0 | .1 |
| 216 | 1000001000101000 | 4 | 16 | -1.33 | .63 | 1.1 | .5 | 1.2 | .5 |
| 12 | 1000001000100010 | 4 | 16 | -1.33 | .63 | 1.2 | .6 | 1.6 | 1.1 |
| 14 | 00000000 0 1 0 | 1 | 11 | -3.02 | 1.09 | 1.3 | .6 | 3.0 | 1.5 |
| 65 | 1011110000100001 | 7 | 16 | -.31 | .55 | 1.1 | .6 | 1.6 | 1.7 |
| 67 | 1010 0000001100 | 4 | 14 | -1.06 | .65 | 1.2 | .6 | 1.5 | 1.0 |
| 92 | 11010001 1 1 0 | 6 | 11 | -.19 | .65 | 1.1 | .6 | 1.0 | .2 |
| 109 | 0000 0001000000 | 1 | 14 | -3.00 | 1.09 | 1.3 | .6 | 1.7 | .9 |
| 111 | 0010000100000000 | 2 | 16 | -2.31 | .80 | 1.2 | .6 | 1.0 | .3 |
| 114 | 0001 00 0 0 0 | 1 | 9 | -2.85 | 1.12 | 1.3 | .6 | 1.2 | .6 |
| 137 | 1100100011000001 | 6 | 16 | -.62 | .57 | 1.1 | .6 | 1.9 | 2.1 |
| 175 | 1111011010111110 | 12 | 16 | 1.32 | .63 | 1.2 | .6 | 1.1 | .4 |
| 176 | 1111011111111111 | 15 | 16 | 3.18 | 1.08 | 1.3 | .6 | 2.6 | 1.2 |
| 220 | 1100101001100010 | 7 | 16 | -.31 | .55 | 1.1 | .6 | 1.1 | .3 |
| 230 | 1111110100011110 | 11 | 16 | .95 | .59 | 1.1 | .6 | 1.0 | .1 |
| 231 | 1111111011100011 | 12 | 16 | 1.32 | .63 | 1.2 | .6 | 1.0 | .1 |
| 259 | 1011111101010110 | 11 | 16 | .95 | .59 | 1.1 | .6 | 1.3 | .7 |
| 9 | 0010000000000001 | 2 | 16 | -2.31 | .80 | 1.3 | .7 | 6.8 | 3.0 |
| 20 | 0100000100001000 | 3 | 16 | -1.76 | .69 | 1.3 | .7 | 1.3 | .7 |
| 24 | 0100 0 00000010 | 2 | 13 | -2.03 | .84 | 1.3 | .7 | 2.4 | 1.3 |
| 36 | 1111100111011001 | 11 | 16 | .95 | .59 | 1.2 | .7 | 1.1 | .4 |
| 108 | 1100 0000000011 | 4 | 14 | -1.06 | .65 | 1.2 | .7 | 3.2 | 2.8 |
| 190 | 1110111100001110 | 10 | 16 | .61 | .57 | 1.1 | .7 | 1.0 | .2 |
| 196 | 1011010010111000 | 8 | 16 | -.01 | .55 | 1.1 | .7 | 1.0 | .3 |
| 244 | 0110001001100000 | 5 | 16 | -.96 | .59 | 1.2 | .7 | 1.1 | .3 |
| 5 | 0000000001100000 | 2 | 16 | -2.31 | .80 | 1.4 | .8 | 1.7 | .9 |
| 98 | 11000001 1 1 0 | 5 | 11 | -.61 | .65 | 1.1 | .8 | 1.1 | .4 |
| 118 | 00001001 0 0 0 | 2 | 11 | -2.13 | .83 | 1.4 | .8 | 1.4 | .7 |
| 129 | 1000001011001000 | 5 | 16 | -.96 | .59 | 1.2 | .8 | 1.1 | .4 |
| 177 | 1111111101011111 | 14 | 16 | 2.32 | .81 | 1.4 | .8 | 1.2 | .6 |
| 218 | 1001010101000010 | 6 | 16 | -.62 | .57 | 1.2 | .8 | 1.2 | .6 |
| 21 | 1001001001011000 | 6 | 16 | -.62 | .57 | 1.2 | .9 | 1.1 | .4 |
| 35 | 1110111000111001 | 10 | 16 | .61 | .57 | 1.2 | .9 | 1.2 | .7 |
| 117 | 0000 1000010000 | 2 | 14 | -2.12 | .83 | 1.4 | .9 | 1.5 | .8 |
| 133 | 1000001010101000 | 5 | 16 | -.96 | .59 | 1.2 | .9 | 1.2 | .5 |
| 134 | 0000011010000000 | 3 | 16 | -1.76 | .69 | 1.4 | .9 | 1.2 | .4 |
| 142 | 1000000001001010 | 4 | 16 | -1.33 | .63 | 1.3 | .9 | 1.8 | 1.3 |
| 200 | 0000000010001000 | 2 | 16 | -2.31 | .80 | 1.4 | .9 | 2.0 | 1.1 |
| 214 | 1100001100010001 | 6 | 16 | -.62 | .57 | 1.2 | .9 | 2.0 | 2.2 |
| 253 | 1101010010001001 | 7 | 16 | -.31 | .55 | 1.2 | .9 | 1.7 | 1.9 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1111 1 11<br>3476218140653952 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 68 | 1000 0011000001 | 4 | 14 | -1.06 | .65 | 1.3 | 1.0 | 2.9 | 2.5 |
| 26 | 0010000010100 | 3 | 15 | -1.75 | .69 | 1.5 | 1.1 | 1.7 | 1.2 |
| 88 | 0100010010000010 | 4 | 16 | -1.33 | .63 | 1.3 | 1.1 | 1.7 | 1.2 |
| 116 | 0001001101000000 | 4 | 16 | -1.33 | .63 | 1.3 | 1.1 | 1.1 | .4 |
| 189 | 1111111001011111 | 13 | 16 | 1.76 | .70 | 1.4 | 1.1 | 1.3 | .6 |
| 201 | 0001011110000000 | 5 | 16 | -.96 | .59 | 1.3 | 1.1 | 1.1 | .4 |
| 258 | 0010100010001000 | 4 | 16 | -1.33 | .63 | 1.3 | 1.1 | 1.3 | .7 |
| 1 | 0100000110000001 | 4 | 16 | -1.33 | .63 | 1.4 | 1.2 | 3.3 | 2.8 |
| 141 | 1111101110010111 | 12 | 16 | 1.32 | .63 | 1.4 | 1.2 | 1.2 | .6 |
| 166 | 1000000101100100 | 5 | 16 | -.96 | .59 | 1.3 | 1.2 | 1.5 | 1.1 |
| 199 | 0100010000100001 | 4 | 16 | -1.33 | .63 | 1.4 | 1.2 | 3.3 | 2.8 |
| 23 | 0000100000010001 | 3 | 16 | -1.76 | .69 | 1.5 | 1.3 | 4. 4.7 | 3.0 |
| 58 | 0100001000001001 | 4 | 16 | -1.33 | .63 | 1.4 | 1.3 | 3.4 | 2.9 |
| 195 | 1110 00011100110 | 8 | 15 | .19 | .57 | 1.3 | 1.3 | 1.2 | .7 |
| 228 | 0001010100000100 | 4 | 16 | -1.33 | .63 | 1.4 | 1.3 | 1.7 | 1.2 |
| 40 | 1111110001110111 | 12 | 16 | 1.32 | .63 | 1.5 | 1.4 | 1.3 | .7 |
| 227 | 1101100111000101 | 9 | 16 | .30 | .56 | 1.3 | 1.4 | 1.5 | 1.4 |
| 8 | 0000001011010000 | 4 | 16 | -1.33 | .63 | 1.5 | 1.5 | 1.4 | .9 |
| 215 | 0000001011001000 | 4 | 16 | -1.33 | .63 | 1.5 | 1.5 | 1.5 | 1.0 |
| 246 | 0010000111001000 | 5 | 16 | -.96 | .59 | 1.4 | 1.6 | 1.4 | .9 |
| 160 | 0101011100000110 | 7 | 16 | -.31 | .55 | 1.4 | 1.8 | 1.7 | 1.8 |
| 204 | 0000011110000100 | 5 | 16 | -.96 | .59 | 1.5 | 1.8 | 1.6 | 1.4 |
| 3 | 1000010001100110 | 6 | 16 | -.62 | .57 | 1.5 | 1.9 | 1.7 | 1.6 |
| 18 | 0000010000100011 | 4 | 16 | -1.33 | .63 | 1.7 | 2.0 | 4.1 | 3.4 |
| 131 | 1000011011011100 | 8 | 16 | -.01 | .55 | 1.4 | 2.1 | 1.4 | 1.2 |
| 74 | 0010110011001100 | 7 | 16 | -.31 | .55 | 1.5 | 2.2 | 1.7 | 1.8 |
| 110 | 1000100010101011 | 7 | 16 | -.31 | .55 | 1.6 | 2.8 | 2.2 | 2.9 |
| 48 | 1111111111111111 | 16 | 16 | 4.26 | ESTIMATED FROM MAX MEASURE OBSERVED | | | | |
| 185 | 1111111111111111 | 16 | 16 | 4.26 | ESTIMATED FROM MAX MEASURE OBSERVED | | | | |
| 262 | 11 111 1 | 6 | 6 | 4.26 | ESTIMATED FROM MAX MEASURE OBSERVED | | | | |
| 79 | 00 000 0 | 0 | 6 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 99 | 0000 0 0 | 0 | 6 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 100 | 00 000 0 | 0 | 6 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 101 | 00 0 0 | 0 | 4 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 103 | 00 | 0 | 2 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 104 | 00 | 0 | 2 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 105 | 0 | 0 | 1 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 115 | 0 | 0 | 1 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| 119 | 0000000 0 0 | 0 | 9 | -4.23 | ESTIMATED FROM MIN MEASURE OBSERVED | | | | |
| | 3476218111151911<br>1406 3 52 | | | | | | | | |

ITEM STATISTICS -- INFIT ORDER

| NUM | NAME | COUNT | SAMPLE | CALIBRTN | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 10 | CAL62 | 103 | 235 | .10 | .15 | 1.3 | 3.9 | 1.5 | 4.2 |
| 13 | EMP92 | 78 | 216 | .62 | .16 | 1.2 | 2.8 | 1.3 | 2.2 |
| 12 | EMP91 | 28 | 216 | 2.32 | .22 | 1.3 | 1.9 | 3.1 | 4.3 |
| 14 | EMP93 | 100 | 216 | .06 | .16 | 1.1 | 1.2 | 1.1 | .9 |
| 15 | EMP94 | 56 | 216 | 1.25 | .18 | 1.1 | .9 | 1.3 | 1.7 |
| 16 | EMP96 | 91 | 216 | .29 | .16 | 1.1 | .9 | 1.1 | .5 |
| 11 | CAL69 | 111 | 230 | -.11 | .15 | 1.1 | .8 | 1.1 | .7 |
| 1 | MAE17 | 120 | 225 | -.37 | .16 | 1.0 | -.3 | .9 | -1.0 |
| 8 | CAL45 | 123 | 241 | -.31 | .15 | 1.0 | -.6 | .9 | -.8 |
| 9 | CAL56 | 59 | 237 | 1.24 | .17 | .9 | -.6 | .9 | -.7 |
| 3 | NOC10 | 201 | 244 | -2.28 | .19 | .8 | -1.6 | .6 | -1.7 |
| 6 | CAL02 | 138 | 245 | -.61 | .15 | .9 | -1.6 | .8 | -1.8 |
| 4 | NOC15 | 165 | 244 | -1.25 | .16 | .8 | -2.3 | .7 | -2.2 |
| 7 | CAL35 | 147 | 241 | -.86 | .15 | .8 | -2.8 | .7 | -2.3 |
| 5 | NOC16 | 90 | 238 | .43 | .16 | .8 | -3.0 | .8 | -1.3 |
| 2 | MAE18 | 124 | 222 | -.51 | .16 | .8 | -3.1 | .9 | -.8 |



ERIC

MEAP MATH; PARTIAL CREDIT OF SHORT VERSION GRADE 10 "BIGSCALE" RASCH ANALYSIS VER. 1.73 Jan 31 20:28:18 1991
INPUT: 262 PERSONS 16 ITEMS ANALYZED: 258 PERSONS 16 ITEMS 4 CATEGORIES TABLE C-1

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1 1111 1 1<br>3476248101635592 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 85 | | 0 | 0 | OUT | | | | | |
| 103 | 22 | 4 | 2 | .12 | .71 | .0 | -3.2 | .0 | -3.5 |
| 119 | 22211 21 2 1 | 14 | 9 | -.11 | .32 | .3 | -3.2 | .2 | -2.9 |
| 115 | 1 | 1 | 1 | -.76 | 1.00 | .0 | -2.4 | .0 | -1.8 |
| 99 | 1211 1 1 | 7 | 6 | -.61 | .41 | .3 | -2.3 | .3 | -2.0 |
| 105 | 2 | 2 | 1 | .15 | 1.00 | .0 | -2.3 | .0 | -3.0 |
| 69 | 3323 22 11223222 | 30 | 14 | .67 | .29 | .4 | -2.0 | .4 | -1.7 |
| 219 | 3333111121221222 | 30 | 16 | .36 | .25 | .5 | -2.0 | .6 | -1.7 |
| 164 | 3123222133221010 | 28 | 16 | .24 | .25 | .6 | -1.8 | .6 | -1.7 |
| 13 | 31 1 1 | 6 | 4 | -.34 | .49 | .3 | -1.7 | .3 | -1.6 |
| 208 | 3333312122201120 | 29 | 16 | .30 | .25 | .6 | -1.7 | .6 | -1.6 |
| 79 | 11 21 2 1 | 8 | 6 | -.41 | .40 | .4 | -1.6 | .5 | -1.5 |
| 123 | 3323322121222300 | 31 | 16 | .43 | .25 | .6 | -1.5 | .6 | -1.5 |
| 127 | 3332323132321222 | 37 | 16 | .87 | .29 | .5 | -1.5 | .5 | -1.2 |
| 169 | 3333121022221200 | 27 | 16 | .18 | .24 | .7 | -1.5 | .7 | -1.4 |
| 81 | 3231 2 1 0 | 12 | 7 | .02 | .38 | .5 | -1.4 | .5 | -1.3 |
| 168 | 3321231313212222 | 33 | 16 | .56 | .26 | .6 | -1.4 | .6 | -1.1 |
| 172 | 3333223323321212 | 38 | 16 | .96 | .31 | .5 | -1.4 | .5 | -1.3 |
| 155 | 3332322332223132 | 39 | 16 | 1.05 | .32 | .5 | -1.3 | .5 | -1.2 |
| 157 | 3233311232222132 | 35 | 16 | .70 | .28 | .6 | -1.3 | .6 | -1.1 |
| 221 | 3321130201211221 | 25 | 16 | .06 | .24 | .7 | -1.3 | .7 | -1.3 |
| 82 | 3232 3 1 1 | 15 | 7 | .44 | .41 | .5 | -1.2 | .5 | -1.1 |
| 89 | 23 3 11 1 | 11 | 6 | .28 | .40 | .5 | -1.2 | .5 | -1.0 |
| 95 | 32023 1221 2 01 | 19 | 12 | .03 | .28 | .7 | -1.2 | .7 | -1.1 |
| 120 | 3223 0 11 0 | 12 | 8 | -.18 | .34 | .6 | -1.2 | .6 | -1.4 |
| 171 | 3333313322321212 | 37 | 16 | .87 | .29 | .6 | -1.1 | .6 | -1.0 |
| 220 | 3322323232312320 | 36 | 16 | .78 | .28 | .6 | -1.1 | .6 | -1.2 |
| 243 | 2333333323323222 | 42 | 16 | 1.42 | .39 | .5 | -1.1 | .7 | -.4 |
| 248 | 3323321112322232 | 35 | 16 | .70 | .28 | .6 | -1.1 | .6 | -1.0 |
| 71 | 3221213221012322 | 29 | 16 | .30 | .25 | .7 | -1.0 | .7 | -1.1 |
| 75 | 3233121331221312 | 33 | 16 | .56 | .26 | .7 | -1.0 | .7 | -.9 |
| 76 | 3213220222121302 | 28 | 16 | .24 | .25 | .7 | -1.0 | .7 | -1.0 |
| 91 | 3321 1 31 1 0 | 15 | 9 | .03 | .33 | .7 | -1.0 | .7 | -1.0 |
| 244 | 1332223132311222 | 33 | 16 | .56 | .26 | .7 | -1.0 | 1.0 | .1 |
| 96 | 23 2 | 7 | 3 | .61 | .67 | .3 | -.9 | .3 | -.9 |
| 126 | 3233223021331221 | 33 | 16 | .56 | .26 | .7 | -.9 | .7 | -.8 |
| 147 | 31 12 3312 212 | 21 | 11 | .50 | .30 | .7 | -.9 | .8 | -.7 |
| 166 | 3222222133322030 | 32 | 16 | .49 | .26 | .7 | -.9 | .7 | -1.1 |
| 200 | 2112231201031021 | 22 | 16 | -.12 | .24 | .8 | -.9 | .8 | -.8 |
| 225 | 3333323323332232 | 43 | 16 | 1.59 | .42 | .5 | -.9 | .5 | -.8 |
| 241 | 3333321223333222 | 40 | 16 | 1.16 | .34 | .6 | -.9 | .6 | -.6 |
| 14 | 12211 1021 3 1 | 15 | 11 | -.25 | .29 | .8 | -.8 | .8 | -.5 |
| 32 | 3333333133223222 | 41 | 16 | 1.28 | .36 | .6 | -.8 | .6 | -.6 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1 1111 1 1<br>3476248101635592 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 56 | 1332222321001020 | 24 | 16 | .00 | .24 | .8 | -.8 | .9 | -.5 |
| 62 | 3312121120331122 | 28 | 16 | .24 | .25 | .8 | -.8 | .8 | -.7 |
| 94 | 3331222313012020 | 28 | 16 | .24 | .25 | .8 | -.8 | .8 | -.8 |
| 97 | 33 22 0 1 | 11 | 6 | .06 | .41 | .7 | -.8 | .6 | -.8 |
| 100 | 20 12 0 1 | 6 | 6 | -.75 | .42 | .6 | -.8 | .6 | -.9 |
| 143 | 3331321321331210 | 32 | 16 | .49 | .26 | .8 | -.8 | .8 | -.7 |
| 149 | 3313323233131221 | 36 | 16 | .78 | .28 | .7 | -.8 | .8 | -.5 |
| 183 | 3333332323223210 | 38 | 16 | .96 | .31 | .7 | -.8 | .5 | -1.1 |
| 247 | 3333333333323222 | 44 | 16 | 1.79 | .47 | .5 | -.8 | .4 | -.9 |
| 261 | 3233211323132012 | 32 | 16 | .49 | .26 | .8 | -.8 | .7 | -.8 |
| 55 | 3331220212031122 | 28 | 16 | .24 | .25 | .8 | -.7 | .8 | -.7 |
| 83 | 13212 1311 0 2 | 17 | 11 | -.08 | .29 | .8 | -.7 | .9 | -.4 |
| 87 | 23 1 2 0 | 8 | 5 | -.15 | .44 | .7 | -.7 | .6 | -.8 |
| 125 | 3332333323321322 | 41 | 16 | 1.28 | .36 | .6 | -.7 | .6 | -.7 |
| 129 | 3122233130231210 | 29 | 16 | .30 | .25 | .8 | -.7 | .8 | -.8 |
| 181 | 3333223313223131 | 38 | 16 | .96 | .31 | .7 | -.7 | .6 | -.8 |
| 212 | 3133322102321102 | 29 | 16 | .30 | .25 | .8 | -.7 | .8 | -.7 |
| 224 | 3333333321311210 | 35 | 16 | .70 | .28 | .8 | -.7 | .7 | -.8 |
| 230 | 3333322323233332 | 43 | 16 | 1.59 | .42 | .6 | -.7 | .6 | -.5 |
| 237 | 3333132331213210 | 34 | 16 | .63 | .27 | .8 | -.7 | .7 | -.7 |
| 4 | 30120 1200 1 0 | 10 | 11 | -.71 | .32 | .8 | -.6 | .7 | -.6 |
| 44 | 3333323333323232 | 44 | 16 | 1.79 | .47 | .5 | -.6 | .5 | -.6 |
| 70 | 2323323031101011 | 26 | 16 | .12 | .24 | .8 | -.6 | .8 | -.7 |
| 116 | 2223023133220211 | 29 | 16 | .30 | .25 | .8 | -.6 | .8 | -.6 |
| 145 | 3332333333211220 | 37 | 16 | .87 | .29 | .7 | -.6 | .7 | -.8 |
| 154 | 3323323323021201 | 33 | 16 | .56 | .26 | .8 | -.6 | .8 | -.7 |
| 162 | 3333333232201212 | 36 | 16 | .78 | .28 | .8 | -.6 | .7 | -.7 |
| 215 | 1122133131131120 | 26 | 16 | .12 | .24 | .8 | -.6 | .9 | -.2 |
| 249 | 3331333323332222 | 41 | 16 | 1.28 | .36 | .7 | -.6 | .9 | -.1 |
| 252 | 3321323133323222 | 38 | 16 | .96 | .31 | .7 | -.6 | .9 | -.1 |
| 259 | 3233323333223332 | 43 | 16 | 1.59 | .42 | .6 | -.6 | .7 | -.4 |
| 66 | 3232121131021203 | 27 | 16 | .18 | .24 | .9 | -.5 | .9 | -.4 |
| 80 | 3331 1 32 1 0 | 17 | 9 | .25 | .34 | .8 | -.5 | .8 | -.5 |
| 102 | 32 | 5 | 2 | .47 | .95 | .2 | -.5 | .2 | -.3 |
| 130 | 3312 02 23211231 | 26 | 14 | .36 | .27 | .8 | -.5 | .8 | -.4 |
| 151 | 3333323333223332 | 44 | 16 | 1.79 | .47 | .6 | -.5 | .6 | -.5 |
| 161 | 3333322103321220 | 33 | 16 | .56 | .26 | .8 | -.5 | .8 | -.5 |
| 175 | 3333233322333332 | 44 | 16 | 1.79 | .47 | .6 | -.5 | .6 | -.4 |
| 233 | 3333231321031122 | 33 | 16 | .56 | .26 | .8 | -.5 | .8 | -.6 |
| 234 | 3333333333333222 | 45 | 16 | 2.04 | .55 | .5 | -.5 | .4 | -.8 |
| 16 | 1301022120101010 | 15 | 16 | -.56 | .26 | .8 | -.4 | .8 | -.6 |
| 33 | 3333333132123011 | 35 | 16 | .70 | .28 | .8 | -.4 | .8 | -.5 |
| 43 | 3333333333323232 | 45 | 16 | 2.04 | .55 | .6 | -.4 | .5 | -.6 |
| 51 | 3333333333233322 | 45 | 16 | 2.04 | .55 | .6 | -.4 | .5 | -.6 |
| 90 | 33123 2323 1 0 | 23 | 11 | .46 | .32 | .8 | -.4 | .8 | -.4 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| | 1 1111 1 1<br>3476248101635592 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 163 | 3333332123230220 | 35 | 16 | .70 | .28 | .8 | -.4 | .8 | -.6 |
| 167 | 3333333323323321 | 43 | 16 | 1.59 | .42 | .7 | -.4 | .5 | -.7 |
| 184 | 3333323333213232 | 42 | 16 | 1.42 | .39 | .7 | -.4 | .7 | -.4 |
| 211 | 3223230230321220 | 30 | 16 | .36 | .25 | .9 | -.4 | .8 | -.5 |
| 242 | 3333333331321110 | 36 | 16 | .78 | .28 | .8 | -.4 | .7 | -.6 |
| 86 | 33 1 0 1 | 8 | 5 | -.15 | .44 | .8 | -.3 | .8 | -.4 |
| 124 | 3332233023313211 | 35 | 16 | .70 | .28 | .9 | -.3 | .9 | -.3 |
| 131 | 3122233331233232 | 38 | 16 | .96 | .31 | .8 | -.3 | 1.0 | .1 |
| 153 | 3333213331231322 | 38 | 16 | .96 | .31 | .8 | -.3 | .8 | -.3 |
| 165 | 3333331323323232 | 42 | 16 | 1.42 | .39 | .8 | -.3 | .8 | -.2 |
| 197 | 3333311131133122 | 34 | 16 | .63 | .27 | .9 | -.3 | .9 | -.2 |
| 198 | 3331012223011202 | 26 | 16 | .12 | .24 | .9 | -.3 | .9 | -.2 |
| 205 | 3332220333132220 | 34 | 16 | .63 | .27 | .9 | -.3 | .9 | -.3 |
| 206 | 3331321321323232 | 37 | 16 | .87 | .29 | .8 | -.3 | .9 | -.1 |
| 37 | 3333333323323132 | 43 | 16 | 1.59 | .42 | .8 | -.2 | .6 | -.4 |
| 72 | 3313312312012322 | 32 | 16 | .49 | .26 | .9 | -.2 | .9 | -.1 |
| 78 | 33312 3313 1 2 | 25 | 11 | .68 | .34 | .8 | -.2 | .9 | -.2 |
| 93 | 33 3 2 3 1 | 15 | 6 | 1.03 | .55 | .7 | -.2 | .6 | -.3 |
| 122 | 3333233322303222 | 39 | 16 | 1.05 | .32 | .9 | -.2 | .8 | -.3 |
| 186 | 3333323333333212 | 43 | 16 | 1.59 | .42 | .8 | -.2 | .6 | -.5 |
| 191 | 3333333123323210 | 38 | 16 | .96 | .31 | .9 | -.2 | .8 | -.5 |
| 193 | 3333322333333332 | 45 | 16 | 2.04 | .55 | .7 | -.2 | .7 | -.2 |
| 204 | 1212133313211231 | 30 | 16 | .36 | .25 | .9 | -.2 | 1.1 | .4 |
| 11 | 30331 22 1 | 15 | 8 | .11 | .35 | .9 | -.1 | .9 | .0 |
| 49 | 3333333323333332 | 46 | 16 | 2.42 | .68 | .7 | -.1 | .6 | -.2 |
| 53 | 3333333133231322 | 41 | 16 | 1.28 | .36 | .9 | -.1 | .8 | -.1 |
| 77 | 32 | 5 | 2 | .76 | .94 | .4 | -.1 | .4 | -.2 |
| 104 | 01 | 1 | 2 | -1.42 | .94 | .5 | -.1 | .5 | -.4 |
| 187 | 3331333323323223 | 42 | 16 | 1.42 | .39 | .9 | -.1 | 1.1 | .3 |
| 196 | 3133131321333222 | 36 | 16 | .78 | .28 | .9 | -.1 | 1.0 | .2 |
| 239 | 3333323023331221 | 37 | 16 | .87 | .29 | .9 | -.1 | .9 | .0 |
| 260 | 33313 32 2 | 20 | 8 | .90 | .47 | .8 | -.1 | .9 | .1 |
| 46 | 3333333321323332 | 43 | 16 | 1.59 | .42 | .9 | .0 | .8 | .0 |
| 57 | 3323131033331111 | 32 | 16 | .49 | .26 | 1.0 | .0 | 1.0 | .0 |
| 65 | 3133322320321223 | 35 | 16 | .70 | .28 | 1.0 | .0 | 1.0 | .1 |
| 112 | 10223 112 0 2 | 14 | 10 | -.24 | .31 | 1.0 | .0 | 1.0 | .1 |
| 146 | 3333 23 23301231 | 32 | 14 | .85 | .31 | 1.0 | .0 | .9 | -.2 |
| 148 | 33 3 3 2 | 14 | 5 | 1.75 | .95 | .5 | .0 | .4 | -.2 |
| 202 | 3333323233331123 | 41 | 16 | 1.28 | .36 | .9 | .0 | .8 | -.3 |
| 250 | 0333321322223222 | 35 | 16 | .70 | .28 | 1.0 | .0 | 2.0 | 2.2 |
| 6 | 2032202100000000 | 12 | 16 | -.79 | .29 | 1.0 | .1 | .9 | -.2 |
| 7 | 322200203321 001 | 21 | 15 | -.11 | .25 | 1.0 | .1 | 1.0 | .0 |
| 12 | 3221003111321310 | 24 | 16 | .00 | .24 | 1.0 | .1 | 1.0 | .0 |
| 135 | 3231131331000212 | 26 | 16 | .12 | .24 | 1.0 | .1 | 1.0 | .0 |
| 140 | 3330322333223220 | 36 | 16 | .78 | .28 | 1.0 | .1 | 1.1 | .4 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1 1111 1 1<br>3476248101635592 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 177 | 3333323333233333 | 46 | 16 | 2.42 | .68 | .9 | .1 | .9 | .2 |
| 182 | 3333323333221032 | 39 | 16 | 1.05 | .32 | 1.0 | .1 | .8 | -.3 |
| 223 | 3333333333223202 | 41 | 16 | 1.28 | .36 | 1.0 | .1 | .8 | -.3 |
| 236 | 3330132331210212 | 30 | 16 | .36 | .25 | 1.0 | .1 | 1.0 | .2 |
| 254 | 3230233321320222 | 33 | 16 | .56 | .26 | 1.0 | .1 | 1.1 | .3 |
| 255 | 3333331313223230 | 38 | 16 | .96 | .31 | 1.0 | .1 | .9 | -.2 |
| 256 | 3333333302021212 | 34 | 16 | .63 | .27 | 1.0 | .1 | 1.0 | .0 |
| 15 | 1011100030200111 | 12 | 16 | -.79 | .29 | 1.0 | .2 | 1.1 | .4 |
| 34 | 33333 3333 3 2 | 32 | 11 | 2.58 | .97 | .7 | .2 | .5 | -.1 |
| 84 | 3333 1 | 13 | 5 | 1.03 | .67 | .9 | .2 | .6 | -.1 |
| 101 | 00 1 1 | 2 | 4 | -1.53 | .67 | .9 | .2 | 1.1 | .4 |
| 128 | 3323323133033222 | 38 | 16 | .96 | .31 | 1.0 | .2 | 1.0 | .2 |
| 133 | 3022233210332220 | 30 | 16 | .36 | .25 | 1.0 | .2 | 1.1 | .3 |
| 159 | 3333221331331302 | 36 | 16 | .78 | .28 | 1.0 | .2 | .9 | -.1 |
| 190 | 3332323313231330 | 38 | 16 | .96 | .31 | 1.0 | .2 | .9 | -.2 |
| 201 | 2013133323111021 | 27 | 16 | .18 | .24 | 1.0 | .2 | 1.0 | .2 |
| 213 | 3021321130001122 | 22 | 16 | -.12 | .24 | 1.0 | .2 | 1.0 | .2 |
| 216 | 3021023222331011 | 26 | 16 | .12 | .24 | 1.0 | .2 | 1.0 | .1 |
| 245 | 33 3333303321210 | 33 | 15 | .74 | .29 | 1.0 | .2 | 1.0 | .1 |
| 17 | 3032031321122002 | 25 | 16 | .06 | .24 | 1.1 | .3 | 1.1 | .3 |
| 41 | 3332333123333320 | 40 | 16 | 1.16 | .34 | 1.1 | .3 | .9 | .0 |
| 138 | 3313200102003111 | 21 | 16 | -.18 | .24 | 1.1 | .3 | 1.0 | .2 |
| 158 | 3332333333322302 | 41 | 16 | 1.28 | .36 | 1.1 | .3 | .9 | -.1 |
| 170 | 3333333323233230 | 42 | 16 | 1.42 | .39 | 1.1 | .3 | .7 | -.4 |
| 174 | 13333 3101 2 1 | 21 | 11 | .27 | .30 | 1.1 | .3 | 1.3 | .8 |
| 176 | 3333233333333333 | 47 | 16 | 3.08 | .98 | .9 | .3 | 1.2 | .6 |
| 209 | 3233323331001202 | 31 | 16 | .43 | .25 | 1.0 | .3 | 1.0 | .0 |
| 210 | 3332323101313132 | 34 | 16 | .63 | .27 | 1.1 | .3 | 1.0 | .1 |
| 251 | 3333333303321210 | 36 | 16 | .78 | .28 | 1.1 | .3 | 1.0 | .1 |
| 19 | 3011133101231200 | 22 | 16 | -.12 | .24 | 1.1 | .4 | 1.1 | .3 |
| 59 | 3333331023320222 | 35 | 16 | .70 | .28 | 1.1 | .4 | 1.1 | .3 |
| 194 | 3333333332023321 | 40 | 16 | 1.16 | .34 | 1.1 | .4 | 1.0 | .2 |
| 207 | 3333333233220332 | 41 | 16 | 1.28 | .36 | 1.1 | .4 | 1.0 | .1 |
| 64 | 3320021323132222 | 31 | 16 | .43 | .25 | 1.1 | .5 | 1.2 | .6 |
| 150 | 3333133332203012 | 35 | 16 | .70 | .28 | 1.1 | .5 | 1.0 | .2 |
| 152 | 3333 33 3321 302 | 32 | 13 | 1.10 | .36 | 1.2 | .5 | 1.0 | .1 |
| 160 | 1323123323220332 | 35 | 16 | .70 | .28 | 1.1 | .5 | 1.5 | 1.2 |
| 189 | 3333323331233333 | 44 | 16 | 1.79 | .47 | 1.2 | .5 | 1.1 | .4 |
| 35 | 3332323320333213 | 39 | 16 | 1.05 | .32 | 1.2 | .6 | 1.1 | .3 |
| 38 | 3333333333323133 | 45 | 16 | 2.04 | .55 | 1.3 | .6 | .9 | .2 |
| 60 | 3213012313201302 | 27 | 16 | .18 | .24 | 1.1 | .6 | 1.1 | .5 |
| 114 | 0213 220 1 0 | 11 | 9 | -.41 | .33 | 1.2 | .6 | 1.2 | .6 |
| 117 | 2122 03 20103022 | 20 | 14 | -.05 | .26 | 1.1 | .6 | 1.1 | .6 |
| 134 | 1111033312201222 | 25 | 16 | .06 | .24 | 1.1 | .6 | 1.2 | .9 |
| 141 | 3333333113223333 | 42 | 16 | 1.42 | .39 | 1.2 | .6 | 1.2 | .5 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| | 1 1111 1 1<br>3476248101635592 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 142 | 3201211032231312 | 27 | 16 | .18 | .24 | 1.1 | .6 | 1.1 | .5 |
| 144 | 3333333330233210 | 38 | 16 | .96 | .31 | 1.2 | .6 | 1.0 | .3 |
| 235 | 3313331333333312 | 41 | 16 | 1.28 | .36 | 1.2 | .6 | 1.4 | .9 |
| 257 | 3333313323333230 | 41 | 16 | 1.28 | .36 | 1.2 | .6 | 1.0 | .2 |
| 1 | 1322132013012013 | 25 | 16 | .06 | .24 | 1.2 | .7 | 1.3 | 1.1 |
| 2 | 3002003201220010 | 16 | 16 | -.49 | .26 | 1.2 | .7 | 1.1 | .4 |
| 10 | 33032 00 1 | 12 | 8 | -.24 | .34 | 1.2 | .7 | 1.2 | .6 |
| 26 | 102232011133202 | 23 | 15 | -.01 | .25 | 1.2 | .7 | 1.2 | .9 |
| 30 | 3333333323333230 | 43 | 16 | 1.59 | .42 | 1.3 | .7 | .8 | -.1 |
| 121 | 3303233313323231 | 38 | 16 | .96 | .31 | 1.2 | .7 | 1.5 | 1.2 |
| 139 | 3301333333231120 | 34 | 16 | .63 | .27 | 1.2 | .7 | 1.4 | 1.0 |
| 179 | 3333333333233310 | 42 | 16 | 1.42 | .39 | 1.3 | .7 | .9 | -.1 |
| 180 | 3333333133333022 | 41 | 16 | 1.28 | .36 | 1.3 | .7 | 1.1 | .4 |
| 229 | 333332010332 102 | 29 | 15 | .40 | .26 | 1.2 | .7 | 1.1 | .5 |
| 28 | 3333323332033331 | 41 | 16 | 1.28 | .36 | 1.4 | .8 | 1.2 | .6 |
| 36 | 3333331233033223 | 40 | 16 | 1.16 | .34 | 1.4 | .8 | 1.3 | .7 |
| 107 | 3020203232021020 | 22 | 16 | -.12 | .24 | 1.2 | .8 | 1.2 | .6 |
| 173 | 3033333233333122 | 40 | 16 | 1.16 | .34 | 1.3 | .8 | 1.8 | 1.4 |
| 228 | 2023012313220130 | 25 | 16 | .06 | .24 | 1.2 | .8 | 1.2 | .7 |
| 25 | 3032203322021030 | 26 | 16 | .12 | .24 | 1.2 | .9 | 1.2 | .8 |
| 29 | 3333333331323330 | 42 | 16 | 1.42 | .39 | 1.4 | .9 | 1.0 | .2 |
| 47 | 3333333333333313 | 46 | 16 | 2.42 | .68 | 1.7 | .9 | 1.1 | .5 |
| 67 | 3030 22 21131232 | 25 | 14 | .29 | .27 | 1.2 | .9 | 1.3 | 1.0 |
| 106 | 3011332303202100 | 24 | 16 | .00 | .24 | 1.2 | .9 | 1.2 | .8 |
| 217 | 3003323323231011 | 30 | 16 | .36 | .25 | 1.2 | .9 | 1.4 | 1.2 |
| 238 | 3333333330321332 | 41 | 16 | 1.28 | .36 | 1.4 | .9 | 1.3 | .7 |
| 22 | 0001021132201010 | 14 | 16 | -.63 | .27 | 1.3 | 1.0 | 1.2 | .7 |
| 24 | 2301 20 0 020310 | 14 | 13 | -.41 | .29 | 1.3 | 1.0 | 1.3 | 1.0 |
| 27 | 3021000102200013 | 15 | 16 | -.56 | .26 | 1.3 | 1.0 | 1.7 | 1.9 |
| 42 | 3333 31023333320 | 35 | 15 | .91 | .31 | 1.4 | 1.0 | 1.3 | .8 |
| 50 | 3333333333333230 | 44 | 16 | 1.79 | .47 | 1.6 | 1.0 | .9 | .0 |
| 54 | 3333322333333030 | 40 | 16 | 1.16 | .34 | 1.4 | 1.0 | 1.0 | .2 |
| 111 | 0031122103212020 | 20 | 16 | -.24 | .25 | 1.2 | 1.0 | 1.3 | 1.1 |
| 132 | 3203200230001022 | 20 | 16 | -.24 | .25 | 1.3 | 1.0 | 1.3 | 1.1 |
| 136 | 0333223001222022 | 27 | 16 | .18 | .24 | 1.2 | 1.0 | 1.6 | 1.9 |
| 156 | 3023210303021002 | 22 | 16 | -.12 | .24 | 1.2 | 1.0 | 1.2 | 1.0 |
| 178 | 3333323333303230 | 40 | 16 | 1.16 | .34 | 1.5 | 1.0 | 1.2 | .5 |
| 214 | 3312223113003023 | 29 | 16 | .30 | .25 | 1.3 | 1.0 | 1.2 | .8 |
| 218 | 3103220333111322 | 30 | 16 | .36 | .25 | 1.3 | 1.0 | 1.3 | 1.0 |
| 222 | 3333331303223330 | 38 | 16 | .96 | .31 | 1.4 | 1.0 | 1.3 | .7 |
| 226 | 3333333330333232 | 43 | 16 | 1.59 | .42 | 1.6 | 1.0 | 1.5 | .9 |
| 45 | 3333333301323302 | 38 | 16 | .96 | .31 | 1.4 | 1.1 | 1.3 | .8 |
| 61 | 3330333101332200 | 30 | 16 | .36 | .25 | 1.3 | 1.1 | 1.3 | 1.0 |
| 73 | 3232103331003022 | 28 | 16 | .24 | .25 | 1.3 | 1.1 | 1.2 | .8 |
| 92 | 33230 1133 3 0 | 22 | 11 | .37 | .31 | 1.4 | 1.1 | 1.3 | .8 |

OBSERVATIONS SORTED BY INFIT:
PERSON/ITEM

| PERSON | 1 1111 1 1<br>3476248101635592 | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 113 | 03 2 0 2 | 7 | 5 | -.14 | .43 | 1.5 | 1.1 | 1.5 | 1.1 |
| 192 | 3333333323333330 | 44 | 16 | 1.79 | .47 | 1.7 | 1.1 | 1.0 | .2 |
| 246 | 1230230233230011 | 26 | 16 | .12 | .24 | 1.3 | 1.1 | 1.3 | 1.3 |
| 31 | 3333333331333330 | 43 | 16 | 1.59 | .42 | 1.7 | 1.2 | 1.2 | .5 |
| 39 | 3333333323333030 | 41 | 16 | 1.28 | .36 | 1.6 | 1.2 | 1.1 | .4 |
| 40 | 3333321330323333 | 41 | 16 | 1.28 | .36 | 1.6 | 1.2 | 1.6 | 1.1 |
| 68 | 3121 30 31001023 | 20 | 14 | -.05 | .26 | 1.3 | 1.2 | 1.4 | 1.3 |
| 98 | 33220 1033 3 2 | 22 | 11 | .37 | .31 | 1.4 | 1.2 | 1.3 | .9 |
| 109 | 0022 01 30210020 | 13 | 14 | -.56 | .29 | 1.4 | 1.2 | 1.4 | 1.1 |
| 118 | 10123 2003 1 2 | 15 | 11 | -.25 | .29 | 1.4 | 1.2 | 1.4 | 1.1 |
| 137 | 3310331230022113 | 28 | 16 | .24 | .25 | 1.3 | 1.2 | 1.3 | 1.1 |
| 258 | 1230331102032202 | 25 | 16 | .06 | .24 | 1.3 | 1.2 | 1.4 | 1.4 |
| 21 | 3003123231233012 | 29 | 16 | .30 | .25 | 1.4 | 1.3 | 1.4 | 1.4 |
| 74 | 2130332330131232 | 32 | 16 | .49 | .26 | 1.4 | 1.3 | 1.5 | 1.4 |
| 203 | 3301003231232102 | 26 | 16 | .12 | .24 | 1.3 | 1.3 | 1.3 | 1.3 |
| 9 | 0032221011021223 | 22 | 16 | -.12 | .24 | 1.4 | 1.4 | 1.6 | 2.1 |
| 240 | 3332303001003212 | 26 | 16 | .12 | .24 | 1.4 | 1.4 | 1.3 | 1.2 |
| 20 | 0311021021023232012 | 23 | 16 | -.06 | .24 | 1.4 | 1.5 | 1.6 | 2.0 |
| 52 | 3333333333333330 | 45 | 16 | 2.04 | .55 | 2.2 | 1.5 | 1.1 | .4 |
| 188 | 3333333103333002 | 36 | 16 | .78 | .28 | 1.5 | 1.5 | 1.4 | 1.0 |
| 231 | 3333333331301303 | 38 | 16 | .96 | .31 | 1.7 | 1.5 | 1.4 | .9 |
| 232 | 3333333333333330 | 45 | 16 | 2.04 | .55 | 2.2 | 1.5 | 1.1 | .4 |
| 195 | 3330 30131311332 | 30 | 15 | .51 | .27 | 1.5 | 1.6 | 1.6 | 1.5 |
| 253 | 3303232320032203 | 31 | 16 | .43 | .25 | 1.5 | 1.6 | 1.5 | 1.4 |
| 8 | 1002033131223100 | 22 | 16 | -.12 | .24 | 1.5 | 1.7 | 1.5 | 1.6 |
| 63 | 3001001323311212 | 23 | 16 | -.06 | .24 | 1.4 | 1.7 | 1.4 | 1.6 |
| 18 | 2002121311301323 | 25 | 16 | .06 | .24 | 1.5 | 1.8 | 1.6 | 1.9 |
| 23 | 2021301100003223 | 20 | 16 | -.24 | .25 | 1.6 | 1.9 | 1.8 | 2.3 |
| 88 | 0302130302222310 | 24 | 16 | .00 | .24 | 1.5 | 1.9 | 1.7 | 2.4 |
| 3 | 3121010330321332 | 28 | 16 | .24 | .25 | 1.6 | 2.0 | 1.5 | 1.7 |
| 227 | 3313330133002133 | 32 | 16 | .49 | .26 | 1.6 | 2.0 | 1.6 | 1.6 |
| 5 | 0002001130320022 | 16 | 16 | -.49 | .26 | 1.8 | 2.4 | 2.0 | 2.5 |
| 58 | 0320223002032213 | 25 | 16 | .06 | .24 | 1.7 | 2.4 | 2.0 | 3.0 |
| 108 | 3302 00 00200303 | 16 | 14 | -.33 | .27 | 1.8 | 2.4 | 2.2 | 2.8 |
| 110 | 3011330120332323 | 30 | 16 | .36 | .25 | 1.7 | 2.4 | 1.8 | 2.2 |
| 199 | 0322020300321223 | 25 | 16 | .06 | .24 | 1.7 | 2.4 | 2.0 | 3.0 |
| 48 | 3333333333333333 | 48 | 16 | 4.06 | ESTIMATED FROM MAX MEASURE OBSERVED | | | | |
| 185 | 3333333333333333 | 48 | 16 | 4.06 | ESTIMATED FROM MAX MEASURE OBSERVED | | | | |
| 262 | 33 33 3 3 | 18 | 6 | 4.06 | ESTIMATED FROM MAX MEASURE OBSERVED | | | | |
| | 3476218111115191<br>4 0163 5 2 | | | | | | | | |

ITEM STATISTICS -- INFIT ORDER

| NUM | NAME | COUNT | SAMPLE | CALIBRTN | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|---|
| 12 | EMP91 | 311 | 216 | .75 | .07 | 1.4 | 4.8 | 1.6 | 5.7 |
| 3 | NOC10 | 653 | 249 | -.96 | .10 | 1.3 | 2.2 | 1.0 | -.2 |
| 4 | NOC15 | 575 | 249 | -.37 | .08 | 1.2 | 2.0 | 1.0 | .0 |
| 10 | CAL62 | 476 | 235 | .05 | .07 | 1.2 | 2.0 | 1.1 | 1.2 |
| 11 | CAL69 | 459 | 230 | .11 | .07 | 1.1 | 1.4 | 1.2 | 1.9 |
| 1 | MAE17 | 476 | 228 | -.02 | .07 | 1.1 | 1.2 | 1.0 | .4 |
| 16 | EMP96 | 432 | 216 | .13 | .07 | 1.1 | 1.1 | 1.1 | .6 |
| 8 | CAL45 | 507 | 243 | -.04 | .07 | 1.0 | .4 | 1.0 | -.2 |
| 13 | EMP92 | 422 | 216 | .18 | .07 | 1.0 | .0 | 1.0 | -.4 |
| 7 | CAL35 | 566 | 245 | -.36 | .08 | 1.0 | -.3 | .8 | -1.2 |
| 6 | CAL02 | 572 | 254 | -.30 | .08 | .9 | -.7 | .9 | -.8 |
| 2 | MAE18 | 496 | 225 | -.17 | .08 | .9 | -1.0 | .8 | -1.4 |
| 15 | EMP94 | 378 | 216 | .41 | .07 | .9 | -1.3 | .9 | -.7 |
| 9 | CAL56 | 402 | 238 | .43 | .07 | .9 | -1.7 | .9 | -.7 |
| 14 | EMP93 | 475 | 216 | -.12 | .08 | .8 | -1.8 | .8 | -1.5 |
| 5 | NOC16 | 439 | 243 | .27 | .07 | .8 | -3.3 | .8 | -2.7 |

MEAP Math 01-07-1991 20:51:11
Table D-1 Students Measurement Report (ordered by Infit).

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 415 | 415 | 48 | 16 | | Maximum | | | | | | 0.00 | 415 |
| 753 | 753 | 48 | 16 | | Maximum | | | | | | 0.00 | 753 |
| 890 | 890 | 18 | 6 | | Maximum | | | | | | 0.00 | 890 |
| 477 | 477 | 4 | 2 | 2.0 | 0.20 | 0.69 | 0.0 | -3 | 0.0 | -3 | 0.00 | 477 |
| 493 | 493 | 14 | 9 | 1.6 | -0.23 | 0.31 | 0.2 | -3 | 0.3 | -3 | 0.22 | 493 |
| 479 | 479 | 2 | 1 | 2.0 | 0.01 | 1.04 | 0.0 | -2 | 0.0 | -2 | 0.00 | 479 |
| 452 | 452 | 8 | 6 | 1.3 | -0.27 | 0.38 | 0.3 | -2 | 0.3 | -2 | -0.07 | 452 |
| 380 | 380 | 6 | 4 | 1.5 | -0.41 | 0.46 | 0.3 | -2 | 0.3 | -1 | 0.49 | 380 |
| 473 | 473 | 7 | 6 | 1.2 | -0.45 | 0.39 | 0.3 | -2 | 0.2 | -2 | 0.07 | 473 |
| 816 | 816 | 30 | 16 | 1.9 | 0.20 | 0.25 | 0.5 | -2 | 0.5 | -2 | 0.24 | 816 |
| 489 | 489 | 1 | 1 | 1.0 | -1.06 | 1.13 | 0.0 | -1 | 0.0 | -1 | 0.00 | 489 |
| 469 | 469 | 7 | 3 | 2.3 | 0.67 | 0.65 | 0.3 | -1 | 0.3 | 0 | 0.09 | 469 |
| 711 | 711 | 38 | 16 | 2.4 | 0.80 | 0.31 | 0.5 | -1 | 0.4 | -1 | 0.43 | 711 |
| 437 | 437 | 30 | 14 | 2.1 | 0.72 | 0.30 | 0.5 | -1 | 0.4 | -1 | 0.24 | 437 |
| 665 | 665 | 37 | 16 | 2.3 | 0.71 | 0.30 | 0.5 | -1 | 0.5 | -1 | 0.33 | 665 |
| 462 | 462 | 11 | 6 | 1.8 | 0.35 | 0.40 | 0.5 | -1 | 0.5 | -1 | 0.43 | 462 |
| 455 | 455 | 15 | 7 | 2.1 | 0.27 | 0.40 | 0.5 | -1 | 0.4 | -1 | 0.49 | 455 |
| 454 | 454 | 12 | 7 | 1.7 | -0.11 | 0.36 | 0.5 | -1 | 0.6 | -1 | 0.58 | 454 |
| 474 | 474 | 6 | 6 | 1.0 | -0.57 | 0.41 | 0.5 | -1 | 0.5 | 0 | 0.19 | 474 |
| 694 | 694 | 39 | 16 | 2.4 | 0.91 | 0.33 | 0.6 | -1 | 0.5 | 0 | 0.24 | 694 |
| 696 | 696 | 35 | 16 | 2.2 | 0.75 | 0.28 | 0.6 | -1 | 0.6 | 0 | 0.19 | 696 |
| 710 | 710 | 37 | 16 | 2.3 | 0.71 | 0.30 | 0.6 | -1 | 0.6 | 0 | 0.40 | 710 |
| 661 | 661 | 31 | 16 | 1.9 | 0.47 | 0.25 | 0.6 | -1 | 0.6 | -1 | 0.46 | 661 |
| 707 | 707 | 33 | 16 | 2.1 | 0.40 | 0.26 | 0.6 | -1 | 0.6 | -1 | 0.17 | 707 |
| 805 | 805 | 29 | 16 | 1.8 | 0.35 | 0.24 | 0.6 | -1 | 0.6 | -1 | 0.49 | 805 |
| 703 | 703 | 28 | 16 | 1.8 | 0.29 | 0.24 | 0.6 | -1 | 0.6 | -1 | 0.45 | 703 |
| 849 | 849 | 25 | 16 | 1.6 | 0.12 | 0.24 | 0.6 | -1 | 0.6 | -1 | 0.26 | 849 |
| 468 | 468 | 19 | 12 | 1.6 | 0.10 | 0.27 | 0.6 | -1 | 0.6 | -1 | 0.32 | 468 |
| 708 | 708 | 27 | 16 | 1.7 | 0.02 | 0.24 | 0.6 | -1 | 0.6 | -1 | 0.48 | 708 |
| 494 | 494 | 12 | 8 | 1.5 | -0.07 | 0.32 | 0.6 | -1 | 0.7 | -1 | 0.52 | 494 |
| 381 | 381 | 15 | 11 | 1.4 | -0.14 | 0.28 | 0.6 | -1 | 0.8 | 0 | -0.12 | 381 |
| 872 | 872 | 33 | 16 | 2.1 | 0.61 | 0.26 | 0.7 | -1 | 0.9 | 0 | 0.04 | 872 |
| 443 | 443 | 33 | 16 | 2.1 | 0.40 | 0.26 | 0.7 | -1 | 0.6 | -1 | 0.23 | 443 |
| 444 | 444 | 28 | 16 | 1.8 | 0.29 | 0.24 | 0.7 | -1 | 0.7 | -1 | 0.19 | 444 |
| 439 | 439 | 29 | 16 | 1.8 | 0.14 | 0.24 | 0.7 | -1 | 0.7 | -1 | 0.03 | 439 |
| 430 | 430 | 28 | 16 | 1.8 | 0.08 | 0.24 | 0.7 | -1 | 0.7 | -1 | 0.14 | 430 |
| 464 | 464 | 15 | 9 | 1.7 | -0.10 | 0.32 | 0.7 | -1 | 0.7 | 0 | 0.49 | 464 |
| 797 | 797 | 22 | 16 | 1.4 | -0.26 | 0.24 | 0.7 | -1 | 0.7 | -1 | 0.18 | 797 |
| 476 | 476 | 5 | 2 | 2.5 | 0.26 | 0.77 | 0.1 | 0 | 0.1 | 0 | 0.37 | 476 |
| 686 | 686 | 14 | 5 | 2.8 | 1.43 | 0.87 | 0.3 | 0 | 0.2 | 0 | 0.51 | 686 |
| 475 | 475 | 2 | 4 | 0.5 | -1.32 | 0.70 | 0.3 | 0 | 0.3 | 0 | -0.44 | 475 |
| 478 | 478 | 1 | 2 | 0.5 | -1.40 | 1.00 | 0.3 | 0 | 0.3 | 0 | -0.08 | 478 |
| 862 | 862 | 45 | 16 | 2.8 | 2.03 | 0.60 | 0.4 | 0 | 0.3 | 0 | 0.50 | 862 |
| 875 | 875 | 44 | 16 | 2.8 | 1.73 | 0.51 | 0.4 | 0 | 0.3 | 0 | 0.49 | 875 |
| 450 | 450 | 5 | 2 | 2.5 | 0.61 | 0.91 | 0.4 | 0 | 0.4 | 0 | 0.12 | 450 |
| 401 | 401 | 32 | 11 | 2.9 | 2.55 | 0.96 | 0.5 | 0 | 0.2 | 0 | 0.37 | 401 |
| 410 | 410 | 45 | 16 | 2.8 | 2.24 | 0.60 | 0.5 | 0 | 0.4 | 0 | 0.40 | 410 |

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Table D-1 Students Measurement Report (ordered by Infit) - cont'd

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 411 | 411 | 44 | 16 | 2.8 | 1.73 | 0.51 | 0.5 | 0 | 0.5 | 0 | 0.30 | 411 |
| 871 | 871 | 42 | 16 | 2.6 | 1.52 | 0.41 | 0.5 | 0 | 0.9 | 0 | 0.25 | 871 |
| 853 | 853 | 43 | 16 | 2.7 | 1.50 | 0.45 | 0.5 | 0 | 0.5 | 0 | 0.34 | 853 |
| 418 | 418 | 45 | 16 | 2.8 | 2.03 | 0.60 | 0.6 | 0 | 0.4 | 0 | 0.40 | 418 |
| 690 | 690 | 44 | 16 | 2.8 | 1.73 | 0.51 | 0.6 | 0 | 0.6 | 0 | 0.21 | 690 |
| 663 | 663 | 41 | 16 | 2.6 | 1.37 | 0.38 | 0.6 | 0 | 0.5 | 0 | 0.35 | 663 |
| 470 | 470 | 11 | 6 | 1.8 | -0.05 | 0.39 | 0.6 | 0 | 0.6 | -1 | 0.48 | 470 |
| 416 | 416 | 46 | 16 | 2.9 | 2.67 | 0.73 | 0.7 | 0 | 0.6 | 0 | 0.29 | 416 |
| 761 | 761 | 45 | 16 | 2.8 | 2.03 | 0.60 | 0.7 | 0 | 0.8 | 0 | 0.16 | 761 |
| 706 | 706 | 43 | 16 | 2.7 | 1.50 | 0.45 | 0.7 | 0 | 0.5 | 0 | 0.45 | 706 |
| 754 | 754 | 43 | 16 | 2.7 | 1.50 | 0.45 | 0.7 | 0 | 0.6 | 0 | 0.39 | 754 |
| 858 | 858 | 43 | 16 | 2.7 | 1.50 | 0.45 | 0.7 | 0 | 0.6 | 0 | 0.15 | 858 |
| 887 | 887 | 43 | 16 | 2.7 | 1.50 | 0.45 | 0.7 | 0 | 0.9 | 0 | 0.10 | 887 |
| 877 | 877 | 41 | 16 | 2.6 | 1.37 | 0.38 | 0.7 | 0 | 0.8 | 0 | 0.28 | 877 |
| 399 | 399 | 41 | 16 | 2.6 | 1.16 | 0.38 | 0.7 | 0 | 0.6 | 0 | 0.33 | 399 |
| 466 | 466 | 15 | 6 | 2.5 | 1.09 | 0.55 | 0.7 | 0 | 0.5 | 0 | 0.42 | 466 |
| 869 | 869 | 40 | 16 | 2.5 | 1.02 | 0.35 | 0.7 | 0 | 0.6 | 0 | 0.24 | 869 |
| 751 | 751 | 38 | 16 | 2.4 | 1.01 | 0.31 | 0.7 | 0 | 0.6 | 0 | 0.53 | 751 |
| 888 | 888 | 20 | 8 | 2.5 | 0.92 | 0.45 | 0.7 | 0 | 0.7 | 0 | 0.19 | 888 |
| 749 | 749 | 38 | 16 | 2.4 | 0.91 | 0.31 | 0.7 | 0 | 0.7 | 0 | 0.47 | 749 |
| 457 | 457 | 13 | 5 | 2.6 | 0.83 | 0.64 | 0.7 | 0 | 0.5 | 0 | 0.56 | 457 |
| 876 | 876 | 35 | 16 | 2.2 | 0.75 | 0.28 | 0.7 | 0 | 0.6 | 0 | 0.15 | 876 |
| 683 | 683 | 37 | 16 | 2.3 | 0.71 | 0.30 | 0.7 | 0 | 0.7 | 0 | 0.51 | 683 |
| 688 | 688 | 36 | 16 | 2.3 | 0.62 | 0.29 | 0.7 | 0 | 0.7 | 0 | 0.32 | 688 |
| 701 | 701 | 36 | 16 | 2.3 | 0.62 | 0.29 | 0.7 | 0 | 0.7 | 0 | 0.42 | 701 |
| 817 | 817 | 36 | 16 | 2.3 | 0.62 | 0.29 | 0.7 | 0 | 0.6 | 0 | 0.37 | 817 |
| 664 | 664 | 33 | 16 | 2.1 | 0.61 | 0.26 | 0.7 | 0 | 0.7 | 0 | 0.30 | 664 |
| 685 | 685 | 21 | 11 | 1.9 | 0.54 | 0.31 | 0.7 | 0 | 0.7 | 0 | 0.03 | 685 |
| 852 | 852 | 35 | 16 | 2.2 | 0.54 | 0.28 | 0.7 | 0 | 0.7 | 0 | 0.56 | 852 |
| 681 | 681 | 32 | 16 | 2.0 | 0.33 | 0.26 | 0.7 | 0 | 0.7 | 0 | 0.43 | 681 |
| 456 | 456 | 17 | 11 | 1.5 | 0.02 | 0.28 | 0.7 | 0 | 0.8 | 0 | 0.11 | 456 |
| 460 | 460 | 8 | 5 | 1.6 | -0.22 | 0.41 | 0.7 | 0 | 0.7 | 0 | 0.45 | 460 |
| 369 | 369 | 10 | 11 | 0.9 | -0.57 | 0.31 | 0.7 | 0 | 0.7 | 0 | 0.36 | 369 |
| 743 | 743 | 44 | 16 | 2.8 | 1.94 | 0.51 | 0.8 | 0 | 0.8 | 0 | 0.19 | 743 |
| 404 | 404 | 43 | 16 | 2.7 | 1.50 | 0.45 | 0.8 | 0 | 0.6 | 0 | 0.35 | 404 |
| 752 | 752 | 42 | 16 | 2.6 | 1.31 | 0.41 | 0.8 | 0 | 0.7 | 0 | 0.25 | 752 |
| 692 | 692 | 38 | 16 | 2.4 | 1.01 | 0.31 | 0.8 | 0 | 0.8 | 0 | 0.22 | 692 |
| 870 | 870 | 36 | 16 | 2.3 | 0.83 | 0.29 | 0.8 | 0 | 0.7 | 0 | 0.58 | 870 |
| 880 | 880 | 38 | 16 | 2.4 | 0.80 | 0.31 | 0.8 | 0 | 0.8 | 0 | 0.09 | 880 |
| 865 | 865 | 34 | 16 | 2.1 | 0.68 | 0.27 | 0.8 | 0 | 0.8 | 0 | 0.44 | 865 |
| 700 | 700 | 33 | 16 | 2.1 | 0.61 | 0.26 | 0.8 | 0 | 0.8 | 0 | 0.42 | 700 |
| 702 | 702 | 35 | 16 | 2.2 | 0.54 | 0.28 | 0.8 | 0 | 0.8 | 0 | 0.48 | 702 |
| 889 | 889 | 32 | 16 | 2.0 | 0.54 | 0.26 | 0.8 | 0 | 0.8 | 0 | 0.28 | 889 |
| 451 | 451 | 25 | 11 | 2.3 | 0.53 | 0.34 | 0.8 | 0 | 0.8 | 0 | 0.28 | 451 |
| 693 | 693 | 33 | 16 | 2.1 | 0.40 | 0.26 | 0.8 | 0 | 0.8 | 0 | 0.44 | 693 |
| 861 | 861 | 33 | 16 | 2.1 | 0.40 | 0.26 | 0.8 | 0 | 0.8 | 0 | 0.33 | 861 |
| 667 | 667 | 29 | 16 | 1.8 | 0.35 | 0.24 | 0.8 | 0 | 0.7 | -1 | 0.34 | 667 |
| 705 | 705 | 32 | 16 | 2.0 | 0.33 | 0.26 | 0.8 | 0 | 0.7 | 0 | 0.30 | 705 |

Table D-1 Students Measurement Report (ordered by Infit) - cont'd

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 453 | 453 | 17 | 9 | 1.9 | 0.32 | 0.33 | 0.8 | 0 | 0.8 | 0 | 0.45 | 453 |
| 463 | 463 | 23 | 11 | 2.1 | 0.32 | 0.31 | 0.8 | 0 | 0.8 | 0 | 0.41 | 463 |
| 423 | 423 | 28 | 16 | 1.8 | 0.29 | 0.24 | 0.8 | 0 | 0.7 | 0 | 0.21 | 423 |
| 668 | 668 | 26 | 14 | 1.9 | 0.20 | 0.27 | 0.8 | 0 | 0.9 | 0 | 0.13 | 668 |
| 808 | 808 | 30 | 16 | 1.9 | 0.20 | 0.25 | 0.8 | 0 | 0.8 | 0 | 0.35 | 808 |
| 438 | 438 | 26 | 16 | 1.6 | 0.18 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.36 | 438 |
| 490 | 490 | 29 | 16 | 1.8 | 0.14 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.20 | 490 |
| 809 | 809 | 29 | 16 | 1.8 | 0.14 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.33 | 809 |
| 467 | 467 | 28 | 16 | 1.8 | 0.08 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.41 | 467 |
| 424 | 424 | 24 | 16 | 1.5 | 0.06 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.34 | 424 |
| 434 | 434 | 27 | 16 | 1.7 | 0.02 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.16 | 434 |
| 378 | 378 | 15 | 8 | 1.9 | -0.00 | 0.34 | 0.8 | 0 | 0.7 | 0 | 0.27 | 378 |
| 812 | 812 | 26 | 16 | 1.6 | -0.03 | 0.24 | 0.8 | 0 | 0.8 | 0 | 0.14 | 812 |
| 459 | 459 | 8 | 5 | 1.6 | -0.22 | 0.41 | 0.8 | 0 | 0.7 | 0 | 0.48 | 459 |
| 486 | 486 | 14 | 10 | 1.4 | -0.34 | 0.29 | 0.8 | 0 | 0.8 | 0 | -0.01 | 486 |
| 383 | 383 | 15 | 16 | 0.9 | -0.46 | 0.25 | 0.8 | 0 | 0.7 | -1 | 0.23 | 383 |
| 704 | 704 | 42 | 16 | 2.6 | 1.52 | 0.41 | 0.9 | 0 | 0.8 | 0 | 0.24 | 704 |
| 660 | 660 | 39 | 16 | 2.4 | 1.12 | 0.33 | 0.9 | 0 | 0.8 | 0 | 0.29 | 660 |
| 759 | 759 | 38 | 16 | 2.4 | 1.01 | 0.31 | 0.9 | 0 | 0.8 | 0 | 0.48 | 759 |
| 400 | 400 | 35 | 16 | 2.2 | 0.75 | 0.28 | 0.9 | 0 | 0.8 | 0 | 0.45 | 400 |
| 803 | 803 | 37 | 16 | 2.3 | 0.71 | 0.30 | 0.9 | 0 | 0.9 | 0 | 0.08 | 803 |
| 867 | 867 | 37 | 16 | 2.3 | 0.71 | 0.30 | 0.9 | 0 | 0.8 | 0 | 0.35 | 867 |
| 794 | 794 | 34 | 16 | 2.1 | 0.68 | 0.27 | 0.9 | 0 | 0.9 | 0 | 0.20 | 794 |
| 440 | 440 | 32 | 16 | 2.0 | 0.54 | 0.26 | 0.9 | 0 | 0.9 | 0 | 0.11 | 440 |
| 662 | 662 | 35 | 16 | 2.2 | 0.54 | 0.28 | 0.9 | 0 | 0.8 | 0 | 0.31 | 662 |
| 802 | 802 | 34 | 16 | 2.1 | 0.47 | 0.27 | 0.9 | 0 | 0.8 | 0 | 0.33 | 802 |
| 864 | 864 | 30 | 16 | 1.9 | 0.41 | 0.25 | 0.9 | 0 | 1.0 | 0 | 0.25 | 864 |
| 801 | 801 | 30 | 16 | 1.9 | 0.20 | 0.25 | 0.9 | 0 | 1.0 | 0 | -0.04 | 801 |
| 795 | 795 | 26 | 16 | 1.6 | 0.18 | 0.24 | 0.9 | 0 | 0.9 | 0 | 0.21 | 795 |
| 673 | 673 | 26 | 16 | 1.6 | -0.03 | 0.24 | 0.9 | 0 | 1.0 | 0 | 0.25 | 673 |
| 810 | 810 | 22 | 16 | 1.4 | -0.05 | 0.24 | 0.9 | 0 | 0.9 | 0 | 0.11 | 810 |
| 379 | 379 | 24 | 16 | 1.5 | -0.15 | 0.24 | 0.9 | 0 | 0.9 | 0 | 0.18 | 379 |
| 413 | 413 | 43 | 16 | 2.7 | 1.50 | 0.45 | 1.0 | 0 | 0.9 | 0 | 0.22 | 413 |
| 420 | 420 | 41 | 16 | 2.6 | 1.37 | 0.38 | 1.0 | 0 | 0.8 | 0 | 0.31 | 420 |
| 755 | 755 | 42 | 16 | 2.6 | 1.31 | 0.41 | 1.0 | 0 | 1.1 | 0 | 0.09 | 755 |
| 799 | 799 | 41 | 16 | 2.6 | 1.16 | 0.38 | 1.0 | 0 | 0.8 | 0 | 0.27 | 799 |
| 851 | 851 | 41 | 16 | 2.6 | 1.16 | 0.38 | 1.0 | 0 | 0.8 | 0 | 0.42 | 851 |
| 684 | 684 | 32 | 14 | 2.3 | 0.91 | 0.32 | 1.0 | 0 | 0.9 | 0 | 0.35 | 684 |
| 750 | 750 | 39 | 16 | 2.4 | 0.91 | 0.33 | 1.0 | 0 | 0.8 | 0 | 0.35 | 750 |
| 678 | 678 | 36 | 16 | 2.3 | 0.83 | 0.29 | 1.0 | 0 | 1.1 | 0 | 0.28 | 678 |
| 793 | 793 | 36 | 16 | 2.3 | 0.83 | 0.29 | 1.0 | 0 | 1.0 | 0 | 0.08 | 793 |
| 669 | 669 | 38 | 16 | 2.4 | 0.80 | 0.31 | 1.0 | 0 | 1.0 | 0 | -0.03 | 669 |
| 878 | 878 | 35 | 16 | 2.2 | 0.75 | 0.28 | 1.0 | 0 | 1.8 | 1 | -0.11 | 878 |
| 884 | 884 | 34 | 16 | 2.1 | 0.68 | 0.27 | 1.0 | 0 | 0.9 | 0 | 0.36 | 884 |
| 698 | 698 | 36 | 16 | 2.3 | 0.62 | 0.29 | 1.0 | 0 | 0.9 | 0 | 0.30 | 698 |
| 882 | 882 | 33 | 16 | 2.1 | 0.61 | 0.26 | 1.0 | 0 | 1.0 | 0 | 0.18 | 882 |
| 433 | 433 | 35 | 16 | 2.2 | 0.54 | 0.28 | 1.0 | 0 | 0.9 | 0 | 0.12 | 433 |
| 713 | 713 | 21 | 11 | 1.9 | 0.34 | 0.29 | 1.0 | 0 | 1.1 | 0 | 0.17 | 713 |

Table D-1 Students Measurement Report (ordered by Infit) - cont'd

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 425 | 425 | 32 | 16 | 2.0 | 0.33 | 0.26 | 1.0 | 0 | 0.9 | 0 | 0.32 | 425 |
| 806 | 806 | 31 | 16 | 1.9 | 0.26 | 0.25 | 1.0 | 0 | 1.0 | 0 | 0.34 | 806 |
| 680 | 680 | 27 | 16 | 1.7 | 0.23 | 0.24 | 1.0 | 0 | 1.0 | 0 | -0.05 | 680 |
| 671 | 671 | 30 | 16 | 1.9 | 0.20 | 0.25 | 1.0 | 0 | 0.9 | 0 | 0.21 | 671 |
| 384 | 384 | 25 | 16 | 1.6 | 0.12 | 0.24 | 1.0 | 0 | 0.9 | 0 | 0.21 | 384 |
| 672 | 672 | 25 | 16 | 1.6 | 0.12 | 0.24 | 1.0 | 0 | 1.0 | 0 | -0.16 | 672 |
| 798 | 798 | 27 | 16 | 1.7 | 0.02 | 0.24 | 1.0 | 0 | 0.9 | 0 | 0.15 | 798 |
| 813 | 813 | 26 | 16 | 1.6 | -0.03 | 0.24 | 1.0 | 0 | 0.9 | 0 | 0.18 | 813 |
| 372 | 372 | 21 | 15 | 1.4 | -0.04 | 0.24 | 1.0 | 0 | 1.0 | 0 | 0.27 | 372 |
| 386 | 386 | 22 | 16 | 1.4 | -0.05 | 0.24 | 1.0 | 0 | 0.9 | 0 | 0.24 | 386 |
| 393 | 393 | 23 | 15 | 1.5 | -0.15 | 0.24 | 1.0 | 0 | 1.0 | 0 | -0.07 | 393 |
| 491 | 491 | 20 | 14 | 1.4 | -0.20 | 0.25 | 1.0 | 0 | 1.2 | 0 | -0.01 | 491 |
| 488 | 488 | 11 | 9 | 1.2 | -0.29 | 0.32 | 1.0 | 0 | 1.0 | 0 | 0.09 | 488 |
| 676 | 676 | 21 | 16 | 1.3 | -0.31 | 0.24 | 1.0 | 0 | 1.1 | 0 | 0.21 | 676 |
| 389 | 389 | 14 | 16 | 0.9 | -0.73 | 0.26 | 1.0 | 0 | 1.0 | 0 | -0.05 | 389 |
| 371 | 371 | 12 | 16 | 0.8 | -0.87 | 0.27 | 1.0 | 0 | 0.9 | 0 | 0.42 | 371 |
| 382 | 382 | 12 | 16 | 0.8 | -0.87 | 0.27 | 1.0 | 0 | 1.0 | 0 | -0.05 | 382 |
| 744 | 744 | 47 | 16 | 2.9 | 3.21 | 1.03 | 1.1 | 0 | 2.0 | 1 | -0.10 | 744 |
| 745 | 745 | 46 | 16 | 2.9 | 2.47 | 0.73 | 1.1 | 0 | 1.0 | 0 | -0.06 | 745 |
| 709 | 709 | 42 | 16 | 2.6 | 1.31 | 0.41 | 1.1 | 0 | 0.8 | 0 | 0.43 | 709 |
| 697 | 697 | 41 | 16 | 2.6 | 1.16 | 0.38 | 1.1 | 0 | 0.9 | 0 | 0.36 | 697 |
| 666 | 666 | 38 | 16 | 2.4 | 1.01 | 0.31 | 1.1 | 0 | 1.0 | 0 | 0.15 | 666 |
| 758 | 758 | 38 | 16 | 2.4 | 0.80 | 0.31 | 1.1 | 0 | 0.9 | 0 | 0.33 | 758 |
| 883 | 883 | 38 | 16 | 2.4 | 0.80 | 0.31 | 1.1 | 0 | 0.9 | 0 | 0.36 | 883 |
| 699 | 699 | 35 | 16 | 2.2 | 0.75 | 0.28 | 1.1 | 0 | 1.4 | 0 | -0.08 | 699 |
| 879 | 879 | 36 | 16 | 2.3 | 0.62 | 0.29 | 1.1 | 0 | 1.0 | 0 | 0.50 | 879 |
| 873 | 873 | 33 | 15 | 2.2 | 0.58 | 0.29 | 1.1 | 0 | 1.0 | 0 | 0.49 | 873 |
| 427 | 427 | 35 | 16 | 2.2 | 0.54 | 0.28 | 1.1 | 0 | 1.0 | 0 | 0.28 | 427 |
| 689 | 689 | 35 | 16 | 2.2 | 0.54 | 0.28 | 1.1 | 0 | 1.1 | 0 | 0.33 | 689 |
| 807 | 807 | 34 | 16 | 2.1 | 0.47 | 0.27 | 1.1 | 0 | 1.0 | 0 | 0.16 | 807 |
| 432 | 432 | 31 | 16 | 1.9 | 0.26 | 0.25 | 1.1 | 0 | 1.1 | 0 | -0.01 | 432 |
| 857 | 857 | 29 | 15 | 1.9 | 0.24 | 0.26 | 1.1 | 0 | 1.1 | 0 | 0.32 | 857 |
| 856 | 856 | 25 | 16 | 1.6 | 0.12 | 0.24 | 1.1 | 0 | 1.1 | 0 | 0.11 | 856 |
| 428 | 428 | 27 | 16 | 1.7 | 0.02 | 0.24 | 1.1 | 0 | 1.1 | 0 | 0.13 | 428 |
| 481 | 481 | 22 | 16 | 1.4 | -0.05 | 0.24 | 1.1 | 0 | 1.1 | 0 | 0.18 | 481 |
| 366 | 366 | 25 | 16 | 1.6 | -0.09 | 0.24 | 1.1 | 0 | 1.1 | 0 | -0.00 | 366 |
| 485 | 485 | 20 | 16 | 1.3 | -0.16 | 0.24 | 1.1 | 0 | 1.0 | 0 | -0.01 | 485 |
| 376 | 376 | 22 | 16 | 1.4 | -0.26 | 0.24 | 1.1 | 0 | 1.2 | 0 | -0.29 | 376 |
| 367 | 367 | 16 | 16 | 1.0 | -0.60 | 0.25 | 1.1 | 0 | 1.0 | 0 | 0.23 | 367 |
| 691 | 691 | 32 | 13 | 2.5 | 1.17 | 0.38 | 1.2 | 0 | 1.0 | 0 | 0.37 | 691 |
| 804 | 804 | 41 | 16 | 2.6 | 1.16 | 0.38 | 1.2 | 0 | 0.9 | 0 | 0.28 | 804 |
| 408 | 408 | 40 | 16 | 2.5 | 1.02 | 0.35 | 1.2 | 0 | 1.0 | 0 | 0.34 | 408 |
| 762 | 762 | 40 | 16 | 2.5 | 1.02 | 0.35 | 1.2 | 0 | 1.1 | 0 | 0.33 | 762 |
| 677 | 677 | 34 | 16 | 2.1 | 0.68 | 0.27 | 1.2 | 0 | 1.3 | 0 | 0.28 | 677 |
| 815 | 815 | 30 | 16 | 1.9 | 0.41 | 0.25 | 1.2 | 0 | 1.2 | 0 | -0.02 | 815 |
| 811 | 811 | 29 | 16 | 1.8 | 0.14 | 0.24 | 1.2 | 0 | 1.2 | 0 | 0.06 | 811 |
| 435 | 435 | 25 | 14 | 1.8 | 0.12 | 0.26 | 1.2 | 0 | 1.2 | 0 | -0.06 | 435 |
| 675 | 675 | 28 | 16 | 1.8 | 0.08 | 0.24 | 1.2 | 0 | 1.2 | 0 | 0.07 | 675 |

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Table D-1 Students Measurement Report (ordered by Infit) - cont'd

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 674 | 674 | 27 | 16 | 1.7 | 0.02 | 0.24 | 1.2 | 0 | 1.3 | 1 | 0.02 | 674 |
| 436 | 436 | 20 | 14 | 1.4 | 0.01 | 0.25 | 1.2 | 0 | 1.3 | 1 | 0.07 | 436 |
| 392 | 392 | 26 | 16 | 1.6 | -0.03 | 0.24 | 1.2 | 0 | 1.2 | 0 | 0.23 | 392 |
| 874 | 874 | 26 | 16 | 1.6 | -0.03 | 0.24 | 1.2 | 0 | 1.3 | 1 | 0.15 | 874 |
| 695 | 695 | 22 | 16 | 1.4 | -0.05 | 0.24 | 1.2 | 0 | 1.2 | 0 | 0.20 | 695 |
| 886 | 886 | 25 | 16 | 1.6 | -0.09 | 0.24 | 1.2 | 0 | 1.3 | 1 | 0.02 | 886 |
| 480 | 480 | 24 | 16 | 1.5 | -0.15 | 0.24 | 1.2 | 0 | 1.1 | 0 | 0.29 | 480 |
| 377 | 377 | 12 | 8 | 1.5 | -0.32 | 0.32 | 1.2 | 0 | 1.1 | 0 | 0.34 | 377 |
| 492 | 492 | 15 | 11 | 1.4 | -0.35 | 0.28 | 1.2 | 0 | 1.1 | 0 | -0.14 | 492 |
| 670 | 670 | 20 | 16 | 1.3 | -0.37 | 0.24 | 1.2 | 0 | 1.2 | 0 | 0.12 | 670 |
| 391 | 391 | 14 | 13 | 1.1 | -0.43 | 0.27 | 1.2 | 0 | 1.2 | 0 | 0.25 | 391 |
| 394 | 394 | 15 | 16 | 0.9 | -0.46 | 0.25 | 1.2 | 0 | 1.5 | 1 | 0.01 | 394 |
| 483 | 483 | 13 | 14 | 0.9 | -0.67 | 0.27 | 1.2 | 0 | 1.2 | 0 | 0.02 | 483 |
| 397 | 397 | 43 | 16 | 2.7 | 1.50 | 0.45 | 1.3 | 0 | 0.9 | 0 | 0.43 | 397 |
| 747 | 747 | 42 | 16 | 2.6 | 1.42 | 0.41 | 1.3 | 0 | 1.0 | 0 | 0.67 | 747 |
| 885 | 885 | 41 | 16 | 2.6 | 1.37 | 0.38 | 1.3 | 0 | 1.2 | 0 | 0.32 | 885 |
| 682 | 682 | 38 | 16 | 2.4 | 1.01 | 0.31 | 1.3 | 0 | 1.1 | 0 | 0.44 | 682 |
| 402 | 402 | 39 | 16 | 2.4 | 0.91 | 0.33 | 1.3 | 0 | 1.1 | 0 | 0.14 | 402 |
| 659 | 659 | 38 | 16 | 2.4 | 0.80 | 0.31 | 1.3 | 0 | 1.6 | 1 | 0.11 | 659 |
| 465 | 465 | 22 | 11 | 2.0 | 0.43 | 0.30 | 1.3 | 0 | 1.3 | 0 | 0.20 | 465 |
| 471 | 471 | 22 | 11 | 2.0 | 0.43 | 0.30 | 1.3 | 0 | 1.2 | 0 | 0.00 | 471 |
| 814 | 814 | 30 | 16 | 1.9 | 0.41 | 0.25 | 1.3 | 0 | 1.2 | 0 | 0.21 | 814 |
| 487 | 487 | 7 | 5 | 1.4 | -0.29 | 0.43 | 1.3 | 0 | 1.3 | 0 | -0.11 | 487 |
| 405 | 405 | 45 | 16 | 2.8 | 2.24 | 0.60 | 1.4 | 0 | 0.9 | 0 | 0.20 | 405 |
| 748 | 748 | 41 | 16 | 2.6 | 1.37 | 0.38 | 1.4 | 0 | 1.2 | 0 | 0.31 | 748 |
| 863 | 863 | 41 | 16 | 2.6 | 1.16 | 0.38 | 1.4 | 0 | 1.5 | 0 | 0.13 | 863 |
| 757 | 757 | 44 | 16 | 2.8 | 1.73 | 0.51 | 1.5 | 0 | 1.4 | 0 | -0.01 | 757 |
| 395 | 395 | 41 | 16 | 2.6 | 1.37 | 0.38 | 1.5 | 0 | 1.4 | 0 | 0.21 | 395 |
| 396 | 396 | 42 | 16 | 2.6 | 1.31 | 0.41 | 1.5 | 0 | 1.2 | 0 | 0.36 | 396 |
| 679 | 679 | 42 | 16 | 2.6 | 1.31 | 0.41 | 1.5 | 0 | 1.4 | 0 | 0.01 | 679 |
| 421 | 421 | 40 | 16 | 2.5 | 1.02 | 0.35 | 1.5 | 0 | 1.2 | 0 | 0.38 | 421 |
| 417 | 417 | 44 | 16 | 2.8 | 1.94 | 0.51 | 1.6 | 0 | 1.0 | 0 | 0.43 | 417 |
| 442 | 442 | 32 | 16 | 2.0 | 0.33 | 0.26 | 1.3 | 1 | 1.4 | 1 | -0.04 | 442 |
| 441 | 441 | 28 | 16 | 1.8 | 0.29 | 0.24 | 1.3 | 1 | 1.3 | 1 | 0.13 | 441 |
| 429 | 429 | 30 | 16 | 1.9 | 0.20 | 0.25 | 1.3 | 1 | 1.3 | 1 | 0.35 | 429 |
| 388 | 388 | 29 | 16 | 1.8 | 0.14 | 0.24 | 1.3 | 1 | 1.3 | 1 | 0.03 | 388 |
| 385 | 385 | 25 | 16 | 1.6 | 0.12 | 0.24 | 1.3 | 1 | 1.3 | 1 | -0.25 | 385 |
| 375 | 375 | 17 | 11 | 1.5 | 0.02 | 0.28 | 1.3 | 1 | 1.3 | 0 | -0.29 | 375 |
| 387 | 387 | 23 | 16 | 1.4 | 0.01 | 0.24 | 1.3 | 1 | 1.3 | 1 | -0.17 | 387 |
| 800 | 800 | 26 | 16 | 1.6 | -0.03 | 0.24 | 1.3 | 1 | 1.3 | 1 | 0.05 | 800 |
| 868 | 868 | 26 | 16 | 1.6 | -0.03 | 0.24 | 1.3 | 1 | 1.3 | 1 | 0.16 | 868 |
| 373 | 373 | 22 | 16 | 1.4 | -0.05 | 0.24 | 1.3 | 1 | 1.3 | 1 | 0.02 | 373 |
| 390 | 390 | 20 | 16 | 1.3 | -0.16 | 0.24 | 1.3 | 1 | 1.6 | 2 | -0.21 | 390 |
| 431 | 431 | 23 | 16 | 1.4 | -0.20 | 0.24 | 1.3 | 1 | 1.2 | 1 | -0.11 | 431 |
| 881 | 881 | 31 | 16 | 1.9 | 0.47 | 0.25 | 1.4 | 1 | 1.4 | 1 | 0.11 | 881 |
| 368 | 368 | 28 | 16 | 1.8 | 0.08 | 0.24 | 1.4 | 1 | 1.4 | 1 | -0.12 | 368 |
| 461 | 461 | 24 | 16 | 1.5 | 0.06 | 0.24 | 1.4 | 1 | 1.4 | 1 | -0.03 | 461 |
| 403 | 403 | 40 | 16 | 2.5 | 1.23 | 0.35 | 1.5 | 1 | 1.4 | 0 | 0.10 | 403 |

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Table D-1 Students Measurement Report (ordered by Infit) - cont'd

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 712 | 712 | 40 | 16 | 2.5 | 1.02 | 0.35 | 1.5 | 1 | 2.1 | 1 | 0.12 | 712 |
| 746 | 746 | 40 | 16 | 2.5 | 1.02 | 0.35 | 1.5 | 1 | 1.3 | 0 | 0.34 | 746 |
| 850 | 850 | 38 | 16 | 2.4 | 1.01 | 0.31 | 1.5 | 1 | 1.4 | 0 | 0.28 | 850 |
| 412 | 412 | 38 | 16 | 2.4 | 0.80 | 0.31 | 1.5 | 1 | 1.4 | 0 | 0.28 | 412 |
| 409 | 409 | 35 | 15 | 2.3 | 0.76 | 0.32 | 1.5 | 1 | 1.3 | 0 | 0.27 | 409 |
| 792 | 792 | 30 | 15 | 2.0 | 0.34 | 0.27 | 1.5 | 1 | 1.5 | 1 | 0.04 | 792 |
| 866 | 866 | 41 | 16 | 2.6 | 1.37 | 0.38 | 1.6 | 1 | 1.3 | 0 | 0.24 | 866 |
| 756 | 756 | 36 | 16 | 2.3 | 0.62 | 0.29 | 1.6 | 1 | 1.5 | 1 | 0.32 | 756 |
| 855 | 855 | 32 | 16 | 2.0 | 0.33 | 0.26 | 1.6 | 1 | 1.5 | 1 | 0.05 | 855 |
| 370 | 370 | 16 | 16 | 1.0 | -0.60 | 0.25 | 1.6 | 1 | 1.6 | 1 | -0.27 | 370 |
| 760 | 760 | 44 | 16 | 2.8 | 1.73 | 0.51 | 1.7 | 1 | 1.1 | 0 | 0.38 | 760 |
| 406 | 406 | 41 | 16 | 2.6 | 1.16 | 0.38 | 1.7 | 1 | 1.3 | 0 | 0.42 | 406 |
| 859 | 859 | 38 | 16 | 2.4 | 0.80 | 0.31 | 1.7 | 1 | 1.5 | 0 | 0.27 | 859 |
| 854 | 854 | 43 | 16 | 2.7 | 1.50 | 0.45 | 1.8 | 1 | 1.6 | 0 | 0.21 | 854 |
| 414 | 414 | 46 | 16 | 2.9 | 2.47 | 0.73 | 1.9 | 1 | 1.0 | 0 | 0.23 | 414 |
| 398 | 398 | 43 | 16 | 2.7 | 1.50 | 0.45 | 1.9 | 1 | 1.4 | 0 | 0.35 | 398 |
| 407 | 407 | 41 | 16 | 2.6 | 1.37 | 0.38 | 1.9 | 1 | 1.6 | 1 | -0.01 | 407 |
| 419 | 419 | 45 | 16 | 2.8 | 2.03 | 0.60 | 2.2 | 1 | 1.1 | 0 | 0.39 | 419 |
| 860 | 860 | 45 | 16 | 2.8 | 2.03 | 0.60 | 2.2 | 1 | 1.1 | 0 | 0.39 | 860 |
| 796 | 796 | 25 | 16 | 1.6 | -0.09 | 0.24 | 1.5 | 2 | 1.6 | 2 | -0.21 | 796 |
| 484 | 484 | 30 | 16 | 1.9 | 0.20 | 0.25 | 1.6 | 2 | 1.6 | 1 | -0.17 | 484 |
| 426 | 426 | 25 | 16 | 1.6 | -0.09 | 0.24 | 1.6 | 2 | 1.6 | 2 | -0.23 | 426 |
| 374 | 374 | 25 | 16 | 1.6 | 0.12 | 0.24 | 1.7 | 2 | 1.7 | 2 | 0.06 | 374 |
| 482 | 482 | 16 | 14 | 1.1 | -0.46 | 0.26 | 1.8 | 2 | 1.9 | 2 | 0.04 | 482 |

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Count: | Mean: | 29.6 | 14.4 | 2.0 | 0.55 | 0.34 | 1.0 | -0.0 | 0.9 | -0.0 | 0.21 | |
| 263 | S.D.: | 11.1 | 3.6 | 0.5 | 0.73 | 0.15 | 0.4 | 1.0 | 0.4 | 0.9 | 0.19 | |

RMSE 0.38 Adj S.D. 0.62 Separation 1.66 Reliability 0.73

Fixed (all same) chi-square: 878.04 d.f.: 259 significance: 0.00

Random (normal distribution) chi-square: 221.11 d.f.: 258 significance: .95

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Table D-2 Items Measurement Report (ordered by infit)

| Nu | Items | Score | Count | Average | Calib. Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Nu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 496 | 227 | 2.2 | -0.13 | 0.07 | 0.8 | -2 | 0.8 | -1 | 0.40 | 2 |
| 4 | 4 | 577 | 251 | 2.3 | -0.20 | 0.07 | 0.8 | -1 | 0.7 | -1 | 0.36 | 4 |
| 7 | 7 | 568 | 247 | 2.3 | -0.30 | 0.07 | 0.8 | -1 | 0.7 | -2 | 0.37 | 7 |
| 5 | 5 | 440 | 245 | 1.8 | 0.00 | 0.07 | 0.9 | -1 | 0.8 | -1 | 0.36 | 5 |
| 15 | 15 | 381 | 217 | 1.8 | 0.46 | 0.08 | 1.0 | 0 | 1.0 | 0 | 0.28 | 15 |
| 9 | 9 | 405 | 240 | 1.7 | 0.39 | 0.07 | 1.0 | 0 | 1.1 | 0 | 0.25 | 9 |
| 13 | 13 | 422 | 217 | 1.9 | 0.20 | 0.08 | 1.1 | 0 | 1.0 | 0 | 0.25 | 13 |
| 16 | 16 | 435 | 217 | 2.0 | 0.18 | 0.07 | 1.1 | 0 | 1.1 | 0 | 0.26 | 16 |
| 1 | 1 | 480 | 230 | 2.1 | -0.12 | 0.07 | 1.0 | 0 | 1.0 | 0 | 0.26 | 1 |
| 14 | 14 | 478 | 217 | 2.2 | -0.12 | 0.08 | 0.9 | 0 | 0.9 | 0 | 0.31 | 14 |
| 8 | 8 | 512 | 245 | 2.1 | -0.14 | 0.07 | 1.0 | 0 | 0.9 | 0 | 0.29 | 8 |
| 6 | 6 | 576 | 256 | 2.3 | -0.50 | 0.08 | 1.0 | 0 | 0.9 | 0 | 0.29 | 6 |
| 3 | 3 | 657 | 251 | 2.6 | -0.71 | 0.08 | 0.9 | 0 | 0.6 | -1 | 0.31 | 3 |
| 10 | 10 | 479 | 237 | 2.0 | 0.07 | 0.07 | 1.1 | 1 | 1.1 | 1 | 0.20 | 10 |
| 11 | 11 | 461 | 232 | 2.0 | -0.00 | 0.07 | 1.1 | 1 | 1.2 | 1 | 0.26 | 11 |
| 12 | 12 | 314 | 217 | 1.4 | 0.92 | 0.08 | 1.6 | 6 | 1.7 | 6 | 0.00 | 12 |

| Nu | Items | Score | Count | Average | Calib. Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Nu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Count: | Mean: | 480.1 | 234.1 | 2.0 | -0.00 | 0.07 | 1.0 | 0.1 | 1.0 | 0.0 | 0.28 | |
| 16 | S.D.: | 82.7 | 13.8 | 0.3 | 0.37 | 0.00 | 0.2 | 2.0 | 0.2 | 2.1 | 0.09 | |

RMSE 0.07 Adj S.D. 0.37 Separation 4.95 Reliability 0.96
Fixed (all same) chi-square: 378.57 d.f.: 15 significance: 0.00
Random (normal distribution) chi-square: 14.95 d.f.: 14 significance: .38

MEAP MATH; SHORT VERSION GRADE 10
INPUT: 262 PERSONS 16 ITEMS

"BIGSCALE" RASCH ANALYSIS VER. 1.73 Jan 31 20:25:51 1991
ANALYZED: 249 P"RSONS 16 ITEMS 2 CATEGORIES TABLE E-1

SUMMARY OF 2 . ASURED PERSONS

| | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|
| MEAN | 7.0 | 14.8 | -.27 | .68 | 1.0 | .0 | 1.1 | .1 |
| S.D. | 3.8 | 3.0 | 1.33 | .17 | .2 | .9 | .8 | .9 |

RMSE .70 ADJ.S.D. 1.13 PERSON SEP 1.62 PERSON SEP REL. .72

SUMMARY OF 16 CALIBRATED ITEMS

| | COUNT | SAMPLE | CALIBRTN | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|
| MEAN | 108.4 | 230.1 | .00 | .16 | 1.0 | -.2 | 1.1 | .1 |
| S.D. | 43.2 | 11.7 | 1.08 | .02 | .2 | 2.1 | .6 | 2.1 |

RMSE .16 ADJ.S.D. 1.07 ITEM SEP 6.49 ITEM SEP REL. .98

SUMMARY OF CALIBRATED STEPS

| LABEL | VALUE | COUNT | RESIDUAL |
|---|---|---|---|
| 0 | 0 | 1948 | .0 |
| 1 | 1 | 1734 | .0 |

SUMMARY OF 258 MEASURED PERSONS

| | COUNT | TEST | MEASURE | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|
| MEAN | 29.6 | 14.4 | .60 | .34 | 1.0 | .1 | 1.0 | .0 |
| S.D. | 11.0 | 3.6 | .72 | .15 | .4 | 1.0 | .4 | 1.0 |

RMSE .37 ADJ.S.D. .62 PERSON SEP 1.66 PERSON SEP REL. .73

SUMMARY OF 16 CALIBRATED ITEMS

| | COUNT | SAMPLE | CALIBRTN | ERROR | MNSQ | INFIT | MNSQ | OUTFIT |
|---|---|---|---|---|---|---|---|---|
| MEAN | 477.4 | 232.4 | .00 | .08 | 1.0 | .3 | 1.0 | .0 |
| S.D. | 85.1 | 13.8 | .40 | .01 | .2 | 2.0 | .2 | 1.9 |

RMSE .08 ADJ.S.D. .39 ITEM SEP 5.17 ITEM SEP REL. .96

SUMMARY OF CALIBRATED STEPS

| C LABEL | CATEGORY VALUE | STEP OBSERVED COUNT | STEP CALIBR. | STEP ERROR | EXPECTED SCORE CALIBRATIONS STEP-.5 | AT STEP | STEP+.5 | COUNT RESID. |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 469 | NONE | | | EXTREME | -1.07 | -.2 |
| 1 | 1 | 595 | -.16 | .05 | -1.07 | -.46 | -.01 | .1 |
| 2 | 2 | 921 | -.03 | .04 | -.01 | .44 | 1.08 | .1 |
| 3 | 3 | 1734 | .19 | .04 | 1.08 | EXTREME | | .0 |

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FACETS Version No. 2.37 Copyright (c) 1990, John M. Linacre
MEAP Math 01-07-1991 20:51:11 TABLE E-3

Student Summary Report

| Num | Students | Score | Count | Average | Measure Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Num |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Count: | Mean: | 29.6 | 14.4 | 2.0 | 0.55 | 0.34 | 1.0 | -0.0 | 0.9 | -0.0 | 0.21 | |
| 263 | S.D.: | 11.1 | 3.6 | 0.5 | 0.73 | 0.15 | 0.4 | 1.0 | 0.4 | 0.9 | 0.19 | |

RMSE 0.38 Adj S.D. 0.62 Separation 1.66 Reliability 0.73
Fixed (all same) chi-square: 878.04 d.f.: 259 significance: 0.00
Random (normal distribution) chi-square: 221.11 d.f.: 258 significance: .95

Item Summary Report

| Nu | Items | Score | Count | Average | Calib. Logit | Model Error | Infit MnSq | Infit Std | Outfit MnSq | Outfit Std | PtBis | Nu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Count: | Mean: | 480.1 | 234.1 | 2.0 | -0.00 | 0.07 | 1.0 | 0.1 | 1.0 | 0.0 | 0.28 | |
| 16 | S.D.: | 82.7 | 13.8 | 0.3 | 0.37 | 0.00 | 0.2 | 2.0 | 0.2 | 2.1 | 0.09 | |

RMSE 0.07 Adj S.D. 0.37 Separation 4.95 Reliability 0.96
Fixed (all same) chi-square: 378.57 d.f.: 15 significance: 0.00
Random (normal distribution) chi-square: 14.95 d.f.: 14 significance: .38